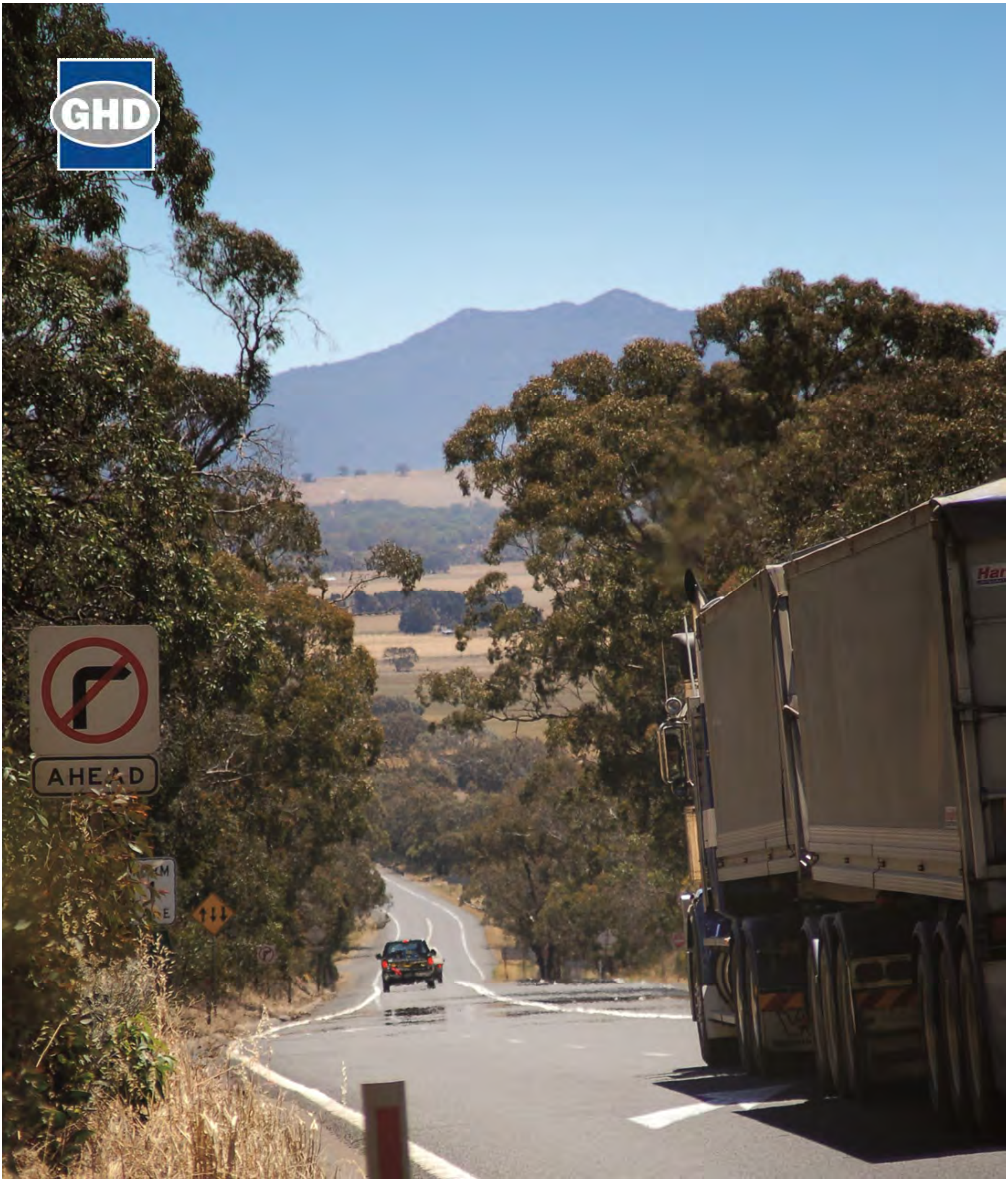

VicRoads

Western Highway Project – Section 2: Beaufort to Ararat

Traffic and Transport Impact Assessment Report

August 2012

This Traffic and Transport Impact Assessment Report *("Report"):*

1. *has been prepared by GHD Pty Ltd ("GHD") for VicRoads;*
2. *may only be used for the purpose] purpose of informing the Environment Effects Statement and Planning Scheme Amendment for the Western Highway Project, Beaufort to Ararat (and must not be used for any other purpose); and*
3. *May be provided to the Department of Planning and Community Development for the purpose of public exhibition as part of the Environment Effects Statement and Planning Scheme Amendment for the Western Highway Project, Beaufort to Ararat.*

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in section 4 Methodology of this Report.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), as specified in section 4 Methodology and throughout this Report.

GHD excludes liability for errors in, or omissions from, this Report arising from or in connection with any of the assumptions being incorrect.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation. GHD has not, and accepts no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was signed.

Executive Summary

VicRoads is progressively upgrading the Western Highway as a four-lane divided highway between Ballarat and Stawell (Western Highway Project). The Western Highway Project consists of three sections, to be constructed in stages. Section 2 (Beaufort to Ararat) of the Western Highway Project (Project) is the subject of this report.

On 27 October 2010, the Victorian Minister for Planning advised that an Environmental Effects Statement (EES) would be required to identify the anticipated environmental effects of the Project. GHD has been commissioned by VicRoads to undertake a Traffic and Transport impact assessment for part of the Project as part of the EES.

Following a multi-criteria assessment of numerous potential alignment options, VicRoads selected an alignment for the Project which was subjected to the risk and impact assessment presented in this report. The Alignments Options (identified as Option 1, Option 2 and Option 3) were subject to the risk and impact assessment presented in this report. The Alignment Options are outlined in Section 6.1 of this report.

This report, together with other technical reports prepared by GHD and other consultants as part of the EES, will inform VicRoads' selection of the preferred and alternate alignment for the Project from the three Alignment Options. VicRoads' preferred and alternate alignment for the Project will be documented in the EES.

The impact assessment has assessed the proposed upgrade of the Western Highway between Beaufort and Ararat (Section 2). The assessment involved assessing the interim (duplicated highway- wide centre median treatments for some intersections and 'left in' and 'left out' access arrangements for all other intersecting roads and properties with current access locations to the Western Highway) and ultimate (duplicated freeway – restricted access limited to grade separated interchanges and service road connecting to the interchanges) upgrade solutions. The Project includes a duplicated road to allow for two lanes in each direction separated by a central median. The assessment has also included assessing the three potential alignments for the corridor between Buangor and the western edge of Langi Ghiran State Park.

The EES scoping requirements for the Traffic and Transport impacts assessment of the Project are detailed in Section 2 of this report. In summary, they require:

- *To provide for the duplication of the Western Highway between Ararat and Stawell to address safety, efficiency and capacity issues; and*
- *To avoid or minimise disruption and other adverse effects on infrastructure, land use (including agriculture) and households, as well as road users resulting from the construction and operation of the Highway duplication.*

The Traffic and Transport impact assessment undertaken by GHD involved a review of available information to assess the existing traffic and transportation conditions within the Project area (as outlined in Section 1.2) and an assessment of each of the Proposed Alignments against the existing conditions to determine the potential positive and negative impacts of the Project on all modes of transport utilising the Western Highway during the construction, interim operation and ultimate operation stages.

A number of benefits regarding road safety and capacity are anticipated. Of note, the duplication is expected to provide sufficient capacity to cater for the forecasted traffic volume until at least 2040. Additionally, the duplication is expected to enable the Highway to increase the posted speed limit from 100 km/h to 110 km/h and provide significantly increased opportunities for overtaking.

In summary, the following impacts (positive and negative) have been identified:

Construction Impacts

The key outcomes from the impact and risk assessment, during the construction stage include:

- Traffic generated during peak construction activities is not anticipated to have an unmanageable impact on the operation of the Western Highway;
- More significant impacts are likely to result from temporary changes to road environments and localised speed reductions, which are expected to be a regulatory requirement;
- The arterial road network is expected to provide connection and capacity for haulage routes, hence minimising operations on the local road network; and
- Accessibility consideration and detour routes, where appropriate, are expected to be detailed in TMPs to mitigate impacts to motorists, local residents, public transport services, emergency services vehicles and other road users.

Overall, the construction of the duplicated Highway is not expected to have unacceptable impacts to the operation of the Highway. The risk assessment has addressed potential operational and road safety impacts and outlined mitigation measures for the identified road users.

Impacts Common to Interim and Ultimate Solutions

The key outcomes from the impact and risk assessment during the interim and ultimate operational stages are both positive and negative impacts and include:

- Improved road safety across the project area through:
  - Increased clear zone widths;
  - Ability for drivers to safely over take vehicles along the length of the Project;
  - Bypassing the township of Buangor; and
  - Providing adequate rest areas facilities that comply with the rest area guidelines.
- Improved traffic operation through:
  - Reduction of access points;
  - Opportunities to over take along the length of the Project;
  - Increased posted speed limit; and
  - Increased capacity to accommodate future traffic volume growth.
- Improvements to the freight task by designing the road to accommodate high productivity freight vehicles thereby allowing:
  - Improvements to efficiency of the freight task by transporting a greater volume in a single vehicle;
  - Reducing the overall heavy vehicle volume by vehicles having the ability to transport a greater volume; and

- Travel time savings for freight vehicles due to a reduction in at-grade intersections and access points and improved overtaking opportunities.

- Minimal impacts to the operation of the rail due to the Project, as the Highway and rail line would continue to be grade separated; and
- Travel time savings for bus routes travelling along the Highway.

Interim Solution Impacts

The interim solution of the Western Highway Project (duplicated highway to AMP3 standard) would be expected to have a couple of impacts which would not be expected for the ultimate solution. These impacts are both positive and negative and include:

- Improved road safety across the project area through:
  - Wide median intersection treatments at key intersection to improve sight distance and stage movements; and
- There is expected to be some localised impacts on travel times for landowners, due to access arrangements. Access for intersecting side roads and direct property access is generally maintained through the provision 'left-in' and 'left-out' access arrangements and therefore this is likely to be increased travel distance for one direction of travel. However, this impact is considered to be acceptable due to the overall benefits for road safety and Highway operations would be provided for general users;

Ultimate Solution Impacts

Additionally, the ultimate solution of the Western Highway Project would also be expected to have impacts which would not be expected in the interim solution. These impacts are also both positive and negative and include:

- Improved road safety across the project area through:
  - Key intersection grade-separation to improve vehicle conflict movements;
  - Grade-separation of one at-grade road-rail crossing and removal of another at-grade road-rail crossing due to restricted access to the freeway;
- Improved traffic operation through:
  - Reduction of access points; and
- Access for intersecting side roads and direct property access is generally maintained through the provision of services roads. There are expected to be some localised impacts on travel times for landowners, particularly the owners with property on both sides of the Highway who require farm machinery to move from one side to another. However, this impact is considered to be acceptable due to the overall benefits for road safety and Highway operations would be provided for general users.
- Increased travel time for vehicles travelling between Western Highway (west of Bunagor) and Buangor-Ben Nevis Road, due to the longer route.
- Due to the proposed highway access arrangements for Buangor-Ben Nevis Road, it is anticipated that there some heavy vehicle volumes travelling through the Buangor township. However given the current average 7-day volume along Buangor-Ben Nevis Road is 131 vehicles per day and only 12

vehicles were recorded (based on counts from the CPG Report 2009) to travel south-west from Buangor-Ben Nevis Road, this is considered to be acceptable.

The design features for the Project are expected to eliminate a high proportion of existing road safety risks and provide for a higher road safety standard than currently exists.

All of the identified risks are considered to be negligible, low or medium provided that the identified mitigation measures (specified in Section 7 of this report) are implemented. Where the residual risk is medium it is predominantly due to the potential for a fatality, which is a catastrophic impact, however whilst the potential likelihood can be reduced it is acknowledged that the risk of fatality remains, as is the case for any other road. Provided all mitigation measures are implemented the risk is considered to be acceptable.

The three Alignment Options were all assessed as having the same impact in regards to the traffic and transportation criteria. Therefore, from a traffic and transportation impact and risk perspective, there is no preferred Alignment Option.

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1. Introduction

1.1 Background and Project Description

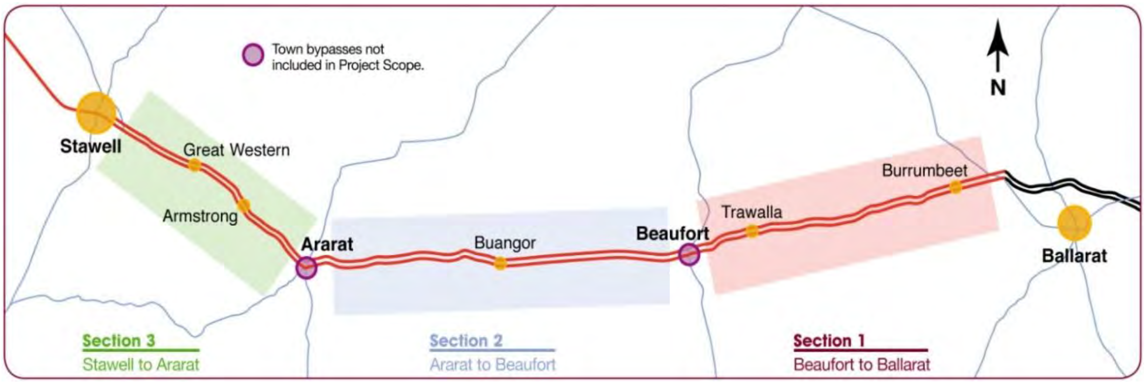
The Western Highway (A8) is being progressively upgraded to a four-lane divided highway for approximately 110 kilometres (km) between Ballarat and Stawell. As the principal road link between Melbourne and Adelaide, the Western Highway serves interstate trade between Victoria and South Australia and is the key transport corridor through Victoria's west. The route supports agriculture, grain production, regional tourism and a range of manufacturing and service activities. Currently, more than 5,500 vehicles per day travel the Highway, west of Ballarat, including 1,500 trucks. This traffic is expected to double by 2025.

The Western Highway Project consists of three stages:

- Section 1: Ballarat to Beaufort;
- Section 2: Beaufort to Ararat; and
- Section 3: Ararat to Stawell.

The three sections to be duplicated are depicted in Figure 1.

Figure 1: The Western Highway Project



Source: VicRoads

Works on an initial 8 km section between Ballarat and Burrumbeet (Section 1A) commenced in April 2010 and will be completed in 2012. Construction for Section 1B (Burrumbeet to Beaufort-Carngham Road) commenced in early 2012 and is expected to be completed by June 2014. The last 3 km section from Beaufort-Carngham Road to Smiths Lane in Beaufort (Section 1C) commenced in late 2011 and will finish in 2012. Separate Environment Effects Statements (EESs) and Planning Scheme Amendments (PSAs) must be prepared for both Sections 2 and 3. It is expected that Sections 2 and 3 will be completed to duplicated highway standard and opened in stages through to 2016, subject to future funding.

Section 2 of the Project commences immediately west of the railway crossing (near Old Shirley Road) west of the Beaufort township and extends for a distance of approximately 38 km to Heath Street, Ararat.

Section 3 of the Project commences at Pollards Lane, Ararat and extends for approximately 24 km to Gilchrist Road, Stawell.

The EES will focus on assessment of the proposed ultimate upgrade of the Western Highway between Beaufort and Stawell to a duplicated highway standard complying with the road category 1 (freeway) of VicRoads Access Management Policy (AMP1). The project includes a duplicated road to allow for two lanes in each direction separated by a central median.

The EES has also considered a proposed interim upgrade of the Western Highway to a highway standard complying with the VicRoads Access Management Policy AMP3. When required, the final stage of the project is proposed to be an upgrade to freeway standard complying with AMP1.

The proposed interim stage of the Project (AMP3) will provide upgraded dual carriageways with wide median treatments at key intersections. Ultimately the Western Highway is proposed to be a freeway (AMP1) where key intersections will be grade separated, service roads constructed and there will be no direct access to the highway.

To date $505 million has been committed for the Western Highway Project by the Victorian Government and the Australian Government as part of the Nation Building Program.

Highway improvements for the three sections between Ballarat and Stawell will involve:

- Constructing two new traffic lanes adjacent to the existing Highway, separated by a central median.
- Converting the existing Highway carriageway to carry two traffic lanes in each direction.
- Constructing sections of new four-lane divided highway on a new alignment.

In addition to separating the traffic lanes, highway safety will be improved with sealed road shoulders, safety barriers, protected turning lanes, intersection improvements, and service lanes for local access at some locations.

Town bypasses of Beaufort and Ararat are not included in the current proposals and are subject to further planning studies. Beyond Stawell to the Victorian border, ongoing Western Highway improvements will continue with shoulder sealing works, new passing lanes and road surface improvements.

The aims/objectives of this Project are to:

- Provide safer conditions for all road users by:
  - Reducing the incidence of head-on and run-off-road crashes;
  - Improving safety at intersections; and
  - Improving safety of access to adjoining properties.
- Improve efficiency of freight by designing for High Productivity Freight Vehicles.
- Provide adequate and improved rest areas.
- Locate alignment to allow for possible future bypasses of Beaufort and Ararat.

1.2 Project Area

The project area was defined for the purposes of characterising the existing conditions for the Project, and to consider alignment alternatives. The project area encompasses a corridor extending up to 1500 metres (m) either side (north and south) of the edge of the road reserve (encompassing the extent of new alignment possibilities) commencing at the railway overpass west of Old Shirley Road, Beaufort and extends for approximately 38 kilometres (km) to Heath Street, Ararat. The study area for the Traffic and Transport assessment is the same as the project area.

1.3 Proposed Alignment

A multi-criteria assessment of alignment options was conducted based on information from the existing conditions assessments. The outcome was the selection of three proposed alignments to take forward to the risk and impact assessment presented in this report. These three alignments are described in Section 6. This report informs the selection of a preferred and alternate alignment from these three alignments for the EES for Section 2. The assessment and selection of the proposed alignments will be documented in Chapter 5 of the EES for Section 2, and in the Options Assessment Paper (Technical Appendix to the EES).

2. EES Scoping Requirements

On 27 October 2010, the Victorian Minister for Planning advised that an EES would be required for the Project. Western Highway Project – Section 2 – Beaufort to Ararat Environment Effects Statement (Scoping Requirements) were prepared by the Department of Planning and Community Development to provide guidance on the matters to be addressed by VicRoads in the EES.

2.1 EES Objectives

For the Traffic and Transport aspects of the Western Highway Project, the relevant draft evaluation objectives outlined in the EES Scoping Requirements are:

- *To provide for the duplication of the Western Highway between Beaufort and Ararat to address safety, efficiency and capacity issues;* and
- *To avoid or minimise disruption and other adverse effects on infrastructure, land use (including agriculture) and households, as well as road users resulting from the construction and operation of the highway duplication.*

2.2 EES Scoping Requirements

Sections 4.2 and 4.5 of the Scoping Requirements, September 2011, stipulate that traffic issues are to be addressed as follows:

- *Identify expected or modelled transport outcomes of the Project in terms of capacity, traffic volumes, travel times, safety and accessibility;*
- *Describe road design features and the alignments that have been adopted to optimise the benefits (including increased safety) of the duplication for road users, having regard to effects on other environmental and social values;*
- *Address potential risk areas to road safety, such as wildlife corridors, and outline any specific measures to avoid, minimise and mitigate road safety issues;*
- *Characterise the current traffic conditions in terms of capacity, travel times, safety and accessibility;*
- *Identify and assess potential effects of the Project on existing traffic conditions, including traffic movement and access. This should include potential effects of heavy vehicles required for construction on nearby existing arterial roads and the ability of these roads to accommodate potential effects during the project's construction;*
- *Identify and assess potential effects of road construction and operation on the rail line and interface especially near intersections and crossings;*
- *Identify traffic management and safety principles for the construction and operation phases, covering (where appropriate) road safety, different traffic routes, hours of use, traffic speeds, types of vehicles and emergency services access provisions;*
- *Assess the consistency of the final project design with the objectives of relevant Victorian transport policies; and*
- *Provide an integrated assessment of the Project, drawing on the findings of specific assessments required under previous sections of this document.*

3. Legislation, Guidelines and Policies

3.1 State

This section provides an overview of the key legislation and policy documents which form the regulatory framework for traffic management within Victoria.

Road management in Victoria is supported primarily through the following policies and legislation:

- *Transport Integration Act 2010*;

  Victoria's new principal transport statute, the *Transport Integration Act 2010* (the TIA), came into effect on 1 July 2010. The TIA creates new charters for Victoria's transport agencies and aligns them with the TIA's vision, objectives and principles for the transport system.

  The new charters build sustainability into agencies' objectives and functions, giving them a 'triple bottom line' focus.

  For example, part of VicRoads' new charter is to "manage the road system in a manner which supports a sustainable Victoria by seeking to increase the share of public transport, walking and cycling trips as a proportion of all transport trips in Victoria".

  All new transport projects must be assessed using a triple bottom line framework which considers the economic, environmental and social costs and benefits of the Project.

  Given that this is a Traffic and Transport assessment, all elements of the TIA are directly relevant and have been considered throughout this assessment. The Social Impact Assessment specialist has also assessed the Project against the TIA. The TIA has six transport system objectives and seven decision-making principles, which are listed in Table 1.

Table 1 TIA Objectives and Decision-Making Principles

Objectives	Decision-Making Principles
– Social and economic inclusion	– Integrated decision
– Economic prosperity	– Triple bottom line assessment
– Environmental sustainability	– Equity
– Integration of transport and land use	– Transport system user perspective
– Efficiency, coordination and reliability	– Precautionary principle
– Safety and health and wellbeing.	– Stakeholder engagement and community participation
	– Transparency

- *Road Management Act, 2004*;

  The *Road Management Act, 2004* provides '*practical guidance to any person conducting, or proposing to conduct, any works on a road in Victoria.*' The Act has been established to promote safe and efficient road networks and a coordinated approach for the management of public roads. The *Road Management Act (General) Regulations, 2005* and the *Road Management Act (Works and Infrastructure) Regulations, 2005* have been established under the Road Management Act and are to be complied with for all public roads.

  Under the Act a number of codes of practice have been made to provide the guidance required for road authorities and works and infrastructure managers. These codes include:

  – Code of Practice for Operational Responsibility for Public Roads;

  – Code of Practice for Clearways and Declared Arterial Roads;

  – Code of Practice for Road Management Plans;

  – Code of Practice for Management of Infrastructure in Road Reserves; and

  – Code of Practice for Worksite Safety – Traffic Management.

- VicRoads Access Management Policies, May 2006;

  The duplication of the Western Highway is to be designed for Access Management Policy 3 (AMP3) and planned to provide for Access Management Policy 1 (AMP1).

  A road classified as AMP1 is to have no direct access except via grade separated interchanges (i.e. freeway standard). This policy facilitates effective management and control of the road network by eliminating the traffic flow interference and conflicts associated by providing total functional separation between the road and adjacent land.

  The principal characteristics of AMP1 include:

  – Allowing the freeway to operate at 110 kilometres/hour (km/h) speed on some rural freeways;

  – The cross section of the road is typically divided;

  – Access to adjacent land is only via grade separated interchanges and the arterial road network;

  – Auxiliary lanes are provided for the purpose of acceleration and deceleration at all entry/exit points to the main carriageways;

  – U-turns would not be permitted except for emergency vehicles at median breaks designated for that purpose;

  – There is no direct access to land abutting the freeway; and

  – Parking is not permitted on the freeway carriageways and access ramps or on intersecting cross roads in the vicinity of the ramp terminals.

  A road classified as AMP3 is to have limited vehicle access from adjacent land which is primarily via widely spaced intersections. This policy facilitates effective management and control of the road network by minimising traffic flow interference and collisions associated with access movements on major rural roads.

  The principal characteristics of AMP3 include:

  – Allowing the road to operate typically at the 100 km/h speed limit;

  – The cross section of the road can be divided or undivided;

- There is a high level of control over site access points, intersection spacing, vehicle turns and crossing movements. Intersections are desirably spaced a minimum of 800 m apart;
  - The location and design of all intersections are required to conform with the specified layout or be approved by the Road Authority;
  - On divided roads, right turns and U-turns are controlled by medians and median breaks;
  - Provision is made for turns to be separated from the through lanes of AMP3 road through the use of deceleration and acceleration lanes;
  - Access to land abutting the AMP3 road should be minimised and sites with access to more than one road should generally be from the road with a lower access management policy; and
  - Parking on the roadway is restricted adjacent to intersections in accordance with standard practices and may be restricted at other locations as determined by the Road Authority.
- Arrive Alive 2008-2017: Victoria's Road Safety Strategy

  This strategy has the objective of significantly improving road safety across the State and substantially reducing the incidence of deaths and serious injuries on Victorian roads. Improvement works to this section of the Western Highway are expected to offer crash reductions over the life of the Project (30 years), which would ultimately contribute to the achievement of this Government objective.

4. Methodology

4.1 Existing Conditions

The traffic and transport existing conditions assessment for the Project has consisted of a on-site observations and a desktop assessment, of the project area, utilising aerial photography and relevant reports and databases.

A number of tasks have been completed for the existing conditions assessment, including:

- Review of completed reports related to the Project including review of traffic data collected in 2009 and 2012 for the project area;
- Visiting the site on a typical day to understand the existing traffic conditions and identify any safety and/or accessibility issues along the route. In addition, any pedestrian, cyclist, public transport and heavy vehicle facilities were identified;
- Undertaking an up-to-date crash history assessment for the project area; and
- Review of the public transport timetables and identifying any existing bus and rail services within the vicinity of the project area.

The review of the existing conditions has provided a basis to inform the options selection and the resulting impacts of those options selected. The alignment options are discussed in Section 6 of this report.

4.2 Impact and Risk Assessment

The following risk assessment methodology was used to determine the traffic and transport pathways for the Western Highway Project – Section 2:

1. Determine the 'impact pathway' (how the Project impacts on a given traffic and transport value or issue).
2. Describe the 'consequences' of the impact pathway.
3. Determine the maximum credible 'consequence level' associated with the risk. Table 2 provides the framework for assigning the level of consequence. The consequence guide was developed with regard to the impacts on general desirable outcomes as informed by typical risk consequence considerations from the Code of Practice for Worksite Safety - Traffic Management (2010), Traffic Management Plans and an understanding of the scale of impacts on the project area.
4. Determine the 'likelihood' of the consequence occurring to the level assigned in step 3. Likelihood descriptors are provided in Table 3.
5. Using the Consequence Level and Likelihood Level in the Risk Matrix in Table 4 to determine the risk rating.

Table 2 Traffic and Transport Impacts Consequence Table

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Road safety (construction)	Occurrence of road accidents resulting in less than 10 property damage only road accidents during construction period.	Occurrence of road accidents resulting in more than 10 property damage only road accidents or minor injury to less than 20 individuals during construction period.	Occurrence of road accidents causing minor injury to between 20 and 100 individuals or major injury to less than 5 individuals during construction period.	Occurrence of road accidents causing minor injury to more than 100 individuals or major injury to between 5 and 50 individuals during construction period.	Occurrence of road accidents resulting in major injury to more than 50 individuals or one or more fatalities during construction period.
Road safety (operation)	Occurrence of road accidents resulting in less than 10 property damage only road accidents during a five-year period.	Occurrence of road accidents resulting in more than 10 property damage only road accidents or minor injury to less than 20 individuals during a five-year period or major injury to less than 5 individuals during a five-year period.	Occurrence of road accidents causing minor injury to between 20 and 100 individuals or major injury to less than 10 individuals during a five-year period.	Occurrence of road accidents causing minor injury to more than 100 individuals or major injury to between 5 and 50 individuals during a five-year period.	Occurrence of road accidents resulting in major injury to more than 50 individuals or one or more fatalities during a five-year period.
Traffic and transport operations (construction & operation)	Negligible adverse impact on traffic and transport conditions.	Detectable adverse changes in traffic and transport condition (decrease in Level of Service) at one or two locations at any one point in time during the construction period or at a single location during duplicated highway operation	Detectable adverse change in traffic and transport conditions (decrease in Level of Service) at multiple locations.	Traffic and transport congestion and delays exceed acceptable levels at multiple locations.	Traffic and transport congestion or events lead to the closure of the Western Highway with no suitable alternative.

Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Traffic access (construction & operation)	Negligible impact on access routes during construction/ operation.	Less than 5 routes with direct access removed.	Greater than 5 and less than 10 routes with direct access removed.	Greater than 10 and less than 30 routes with direct access removed.	Greater than 30 routes with direct access removed.

Table 3 Likelihood Guide

Descriptor	Explanation
Almost Certain	The event is expected to occur in most circumstances
Likely	The event will probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but not expected
Rare	The event may occur only in exceptional circumstances

Table 4 Risk Matrix

Likelihood	Consequence Level				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

4.2.1 Consequence Criteria

The consequence criteria, outlined in Table 2, range on a scale of magnitude from “insignificant” to “catastrophic”. Magnitude was considered a function of the size of the impact, the spatial area affected and expected recovery time of the environment. Consequence criteria descriptions indicating a minimal impact over a local area, and with a recovery time potential within the range of normal variability were considered to be at the negligible end of the scale. Conversely, catastrophic consequence criteria describe scenarios involving a very high magnitude event, a fatality or affecting productivity of the movement of goods.

The traffic and transport consequence criteria for the impact assessment have been established for the effects of:

- Road Safety during construction;
- Road Safety during operation;
- Traffic and Transport operations during construction and operation; and
- Traffic Access during construction and operation.

The consequence criteria range was identified by initially establishing the catastrophic consequence, for each element, which had an impact or a severe impact to an individual.

For the purposes of this assessment, the rationale for a catastrophic event for each element is detailed below:

- A 'road safety' catastrophic event is a single fatality or major injury to more than 50 individuals. If this occurred there is significant impact to the individuals and families of these individuals, as well as the response, repair and support costs incurred by the State. Separate criteria have been set for road safety during construction and operation to better reflect the different timeframes.
- A 'traffic and transport operations' catastrophic event is considered to be extended delays and congestion which restrict the safe and efficient operation of the Highway. As the Highway is a critical link between Melbourne and Adelaide, particularly for freight, closure of the Highway or reduced capacity such that traffic flow is severely affected is not acceptable due to increased costs to transport and the economy.
- A catastrophic event for 'traffic access' is considered to be where existing accesses to the Highway are severed and there is no alternate route to connect to the Western Highway without a significant detour.

4.3 Traffic and Transport Data Sources

The traffic and transport assessment has utilised the following data sources:

- Aerial photography of the project area, 2012;
- CPG Western Highway Duplication Ballarat to Stawell – Traffic Analysis, 2009;
- AECOM Alignment Options Identification and Evaluation Report – Beaufort to Ararat, 2010;
- VicRoads Inter-Office Memo – Western Highway Project (Duplication: Ballarat to Stawell) Proposed Operating Speed Zones, 2011;
- VicRoads publicly available crash data (CrashStats), 2012;
- VicRoads Traffic Count Data along Western Highway, 2012;
- Public Transport Victoria (formerly Metlink) website for public transport timetables, 2012; and
- VicRoads Rest Area Route Plan, Western Highway Project, Ballarat to Stawell, 2011.

4.4 Assumptions and Limitations

The following are noted as limitations and assumptions adopted in undertaking this existing conditions assessment:

- The existing conditions assessment focuses on the existing alignment of the Western Highway and not any of the option corridors. The exact location of option corridors beyond the current Highway alignment were not available at the time of the existing conditions assessment and were generally located on private property. As a result, these locations could not be assessed, however, this has had negligible impact on the assessment;
- In terms of intersecting roads, the assessment focuses on those identified in CPG's Traffic Analysis Report and VicRoads' Western Highway Project Proposed Operating Speed Zones Report. It is assumed that these are of major importance to the local road network; and
- There is little information regarding the use of direct property accesses to the Western Highway. The property accesses have been noted and it is assumed that property access, where required, would be provided via service roads in the AMP1 (freeway) scenario.

5. Existing Conditions

5.1 Definitions

Throughout this section the following acronyms have been used:

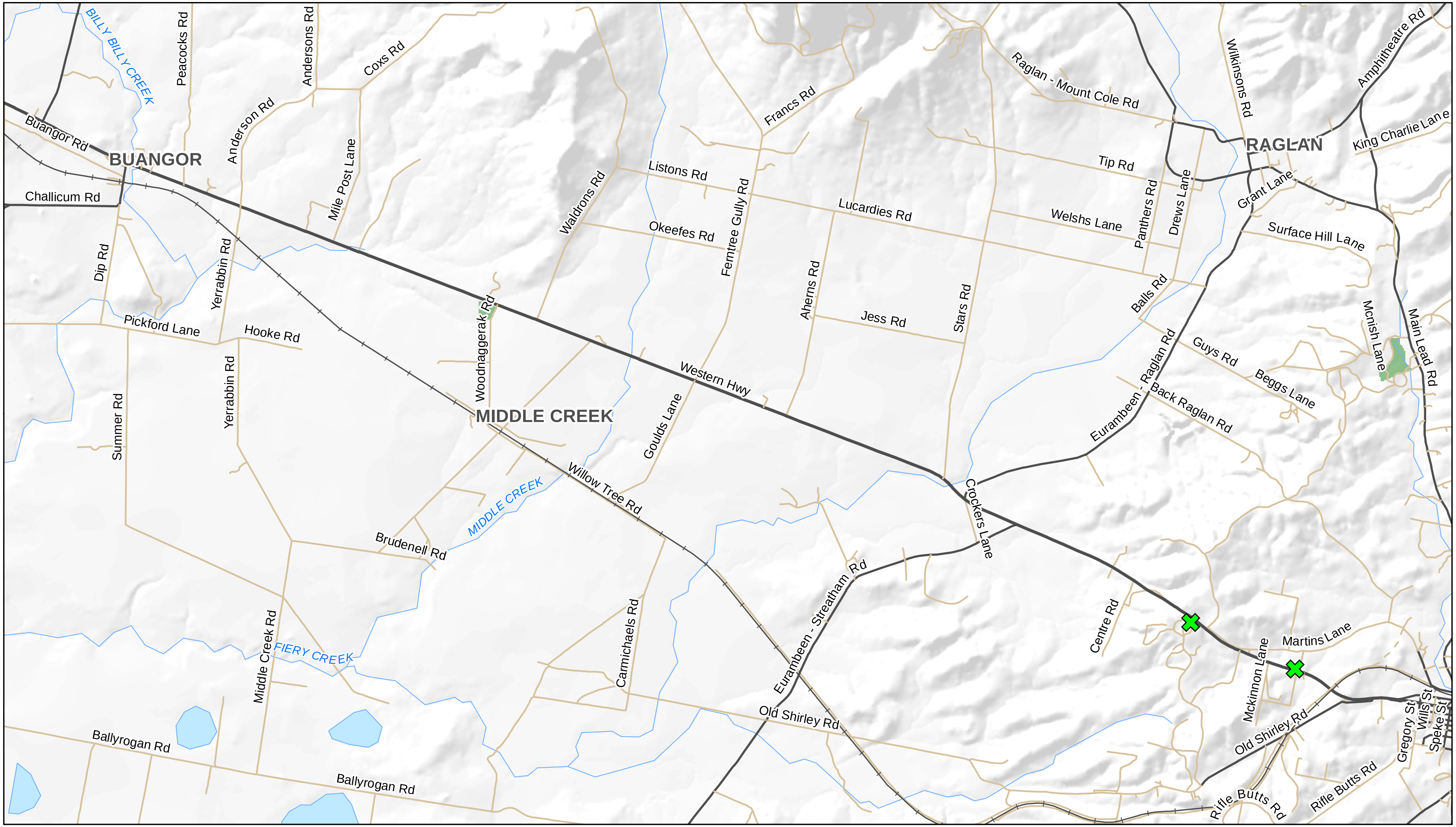
- AUL – Auxiliary left-turn treatment on the major road, i.e. additional short left-turn only lane;
- AUR – Auxiliary right-turn treatment on the major road, i.e. shared through and right-turn lane and additional through lane for overtaking vehicles;
- BAL – Basic left-turn treatment on the major road, i.e. shared left-turn and through lane with minor widening of the shoulder;
- BAR – Basic right-turn treatment on the major road, i.e. shared through and right-turn lane with minor widening of the shoulder;
- CHL – Channelised left-turn treatment on the major road, i.e. additional short left-turn only lane separated from through traffic by painted chevrons and island; and
- CHR – Channelised right-turn treatment on the major road, i.e. additional short right-turn only lane separated from through traffic by a painted or physical island.

5.2 Site Locality

The Western Highway (A8) is the key road link between Melbourne and Adelaide. From Melbourne's western fringe to the Sunraysia Highway (B220) in Ballarat, it is a freeway standard, dual-carriageway road. However, beyond this point, it reduces to a single carriageway two-lane two-way rural highway with overtaking lanes in specific locations. The Western Highway is a VicRoads declared arterial road (highway) which facilitates vehicle movement and supports regional industries. The Highway also carries traffic travelling between Melbourne and Adelaide and forms part of the national highway network.

The Western Highway Project – Section 2 (referred hereafter as 'the Project') extends west of Beaufort to Ararat (approximately 38 km in length). The commencement of the project area is approximately 160 km west of Melbourne. The small township of Buangor is located within the Project alignment project area and the existing Western Highway travels through the town, however the duplication options propose to bypass the township.

A locality plan indicating the location of this project and surrounding road network is provided in Figure 2.



Paper Size A4

0 500 1,000 1,500 2,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

LEGEND

- Rest Areas
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Unsealed track
- Sealed walking/bike trail
- Unsealed walking/bike trail

CLIENTS | PEOPLE | PERFORMANCE

VicRoads
Western Highway Project

Beaufort to Ararat
Section 2
Site Locality Map

Job Number	31-27558
Revision	B
Date	23 Aug 2012

Figure 2A

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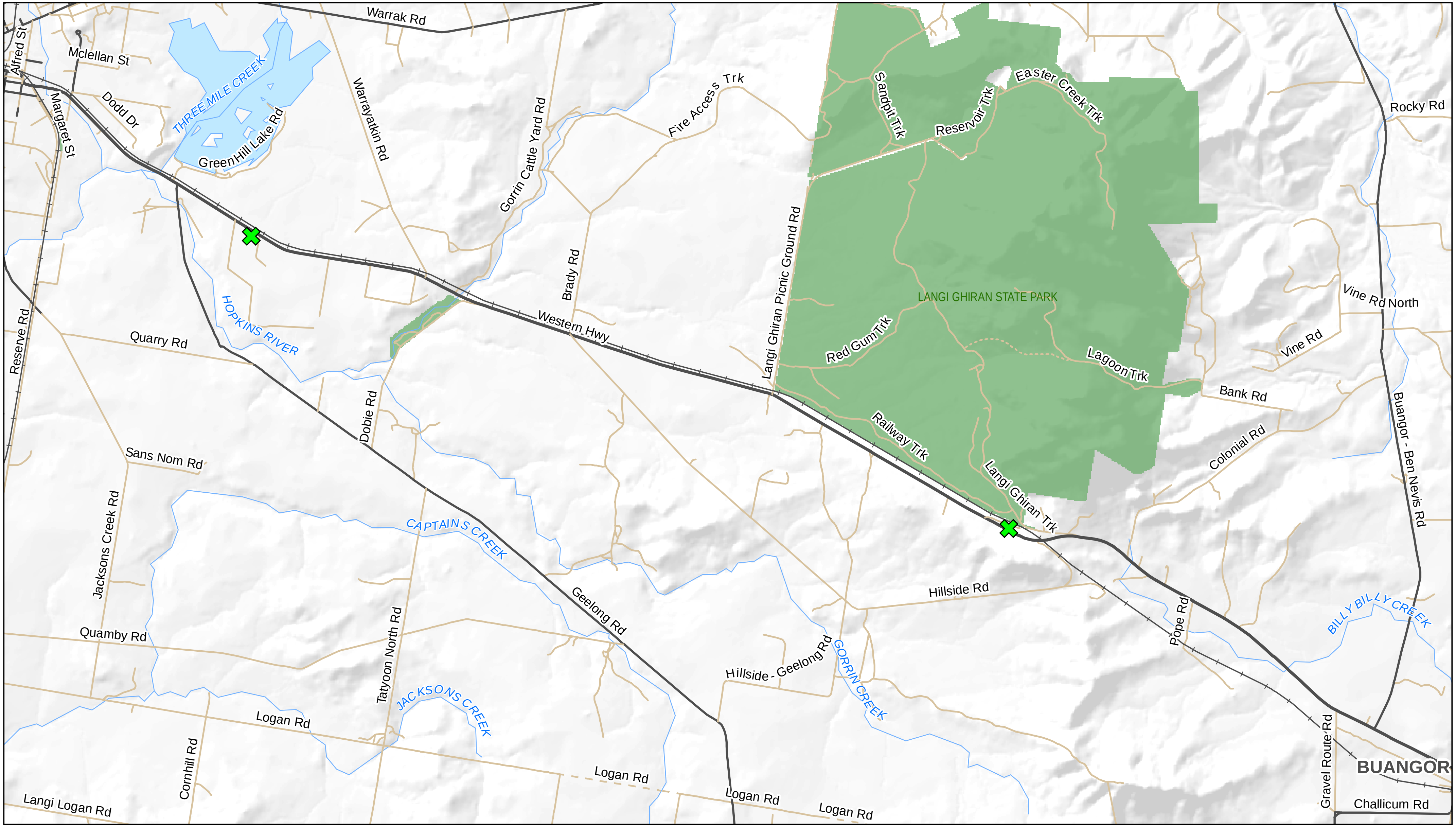
180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE, VicMap, 2012; VicRoads, 2012. Created by:splaird



Paper Size A4

0 500 1,000 1,500 2,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

LEGEND

- Rest Areas
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Unsealed track
- Sealed walking/bike trail
- Unsealed walking/bike trail

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VicRoads
Western Highway Project

Beaufort to Ararat
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Site Locality Map

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Figure 2B

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180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE, VicMap, 2012; VicRoads, 2012. Created by:splaird

5.3 Existing Road Network

This section presents the existing road network within the project area (as defined in Section 1.2). It focuses on the proposed length of the Western Highway to be duplicated and the current intersecting side roads along this section.

5.3.1 Western Highway

The Western Highway (A8) is a National Highway that extends from the Victorian/South Australian border to the Sunraysia Highway, north-west of Ballarat. From the Sunraysia Highway to the outskirts of Melbourne the road is known as the Western Freeway. Within the project area, the Highway has a posted speed limit of 100 km/h, except through the township of Buangor where the posted limit reduces to 90 km/h. The Highway has a typical two-lane, two-way cross section within the project area. Overtaking lanes are provided for each direction of travel at specific locations and auxiliary turn lanes are also provided at intersections, where required. The overtaking lanes are summarised in Table 5, with the turn lanes detailed by intersecting side roads in Section 5.3.2.

Table 5 Location of Overtaking Lanes

Westbound Direction			Eastbound Direction		
Start:	Ch. 158000 m (West of Ballarat-Ararat Rail Line, Beaufort)		**Start:**	Ch. 158000 m (West of Ballarat-Ararat Rail Line, Beaufort)	
	From Chainage	**To Chainage**		**From Chainage**	**To Chainage**
Overtaking lane	159900 m	161300 m			
			Overtaking lane	161100 m	162000 m
Overtaking lane	166500 m	167600 m	Overtaking lane	167700 m	166500 m
Overtaking lane	180000 m	181200 m			
			Overtaking lane	185300 m	186600 m
Overtaking lane	190900 m	191800 m	Overtaking lane	191800 m	191000 m
Finish:	Ch. 198300 m (Heath Street, Ararat)		**Finish:**	Ch. 198300 m (Heath Street, Ararat)	

The existing Highway is typically a flat, straight road, however due to rail overpasses and the natural topography, there are isolated sections where there are crests or curves restricting sight distances. Site inspections identified that there were no locations where there is a significant sight distance issue due to the alignment of the road. The Western Highway has sealed shoulders varying in width along the length of the project area. In addition, there are a combination of wire-rope barriers and W-barriers (steel barriers in 'W' shape) in places along the roadside of the Western Highway. Typical cross sections of the Western Highway are shown in Figure 3 and Figure 4.

Figure 3: Western Highway at CH 190.6 km, view east

Western Highway cross-section located east of Brady Road – Hillside Road intersection.

Figure 4: Western Highway at CH 164.9 km, view east

Western Highway cross-section located east of Stars Road intersection.

Traffic volumes and capacity

The theoretical capacity of the Western Highway within the project area is calculated as 1,237 vehicles per hour (vph) in each direction (i.e. 2,473 vph, two-way), in accordance with Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis. This figure is based on:

- 32% heavy vehicles;
- Level terrain (defined: terrain permitting heavy vehicles to maintain a similar speed as light vehicles);
- A 2.0 m wide shoulder width and 3.7 m wide traffic lanes; and
- An even directional distribution of traffic.

Traffic volume information was collected by VicRoads for the week 29 February 2012 to 6 March 2012. This data is summarised in Table 6 by direction, for average daily volumes and median peak hour volumes.

Table 6 Western Highway Traffic Volumes

Direction	Average 7-Day Volume (veh/day)	Average Weekday Volume (veh/day)	Median Midweek AM Peak Volume (veh/hr)	Median Midweek PM Peak Volume (veh/hr)
Western Highway West of Geelong Road				
Eastbound	All Veh: 2,994 HV: 826	All Veh: 3,079 HV: 971	242 (10:00am-11:00am)	288 (4:00pm-5:00pm)
Westbound	All Veh: 3,111 HV: 894	All Veh: 3,276 HV: 1056	268 (11:00am-12:00pm)	291 (3:00pm-4:00pm)
Total	All Veh: 6,105	All Veh: 6,355		
Western Highway between Martins Lane & Old Shirley Road				
Eastbound	All Veh: 2,903 HV: 853	All Veh: 2,941 HV: 987	255 (11:00am-12:00pm)	297 (4:00pm-5:00pm)
Westbound	All Veh: 3,052 HV: 927	All Veh: 3,219 HV: 1096	236 (10:00am-11:00am)	312 (3:00pm-4:00pm)
Total	All Veh: 5,955	All Veh: 6,160		
Western Highway between Heath Street & Green Hill Lake Road				
Eastbound	All Veh: 2,923 HV: 791	All Veh: 2,913 HV: 906	231 (10:00am-11:00pm)	289 (3:00pm-4:00pm)
Westbound	All Veh: 3,149 HV: 849	All Veh: 3,283 HV: 990	258 (11:00am-12:00pm)	315 (4:00pm-5:00pm)
Total	All Veh: 6,072	All Veh: 6,196		

All Veh – all vehicles; HV – heavy vehicles

Source: VicRoads, 2012

The above data can be summarised as follows:

- There is a relatively even split (per direction) in total traffic volumes over an average 24 hour period;
- There is a 20% - 30% difference in directional split for the peak hours. Given the volumes are low, this difference is not considered to be an issue; and
- The combined volume of heavy vehicles and articulated heavy vehicles ranges between 31% and 34% (for the three sites) on an average weekday, which is a significant proportion of overall traffic.

The hourly volumes presented in Table 6 demonstrate that the Western Highway is currently operating well below theoretical capacity. The maximum observed peak hour volume for available data on the Western Highway (Section 2) is 315 vehicles in the westbound direction, between Heath Street and Green Hill Lake Road, approximately 900 vehicles per direction per hour below theoretical capacity.

As a comparison, traffic volume information was previously collected by CPG for the week 18 May 2009 to 24 May 2009. This data is summarised in Table 7 by direction, for average daily volumes and median peak hour volumes.

Table 7 Western Highway Traffic Volumes West of Buangor (Approx. Ch. 179500 m)

Direction	Average 7-Day Volume (veh/day)	Average Weekday Volume (veh/day)	Median Midweek AM Peak Volume (veh/hr)	Median Midweek PM Peak Volume (veh/hr)
Eastbound	All Veh: 2,470 HV: 626	All Veh: 2,514 HV: 766	180 (11:00am–12:00pm)	214 (3:00pm-4:00pm)
Westbound	All Veh: 2,512 HV: 657	All Veh: 2,588 HV: 813	169 (11:00am–12:00pm)	213 (4:00pm-5:00pm)
Total	All Veh: 4,981	All Veh: 5,102		

All Veh – all vehicles; HV – heavy vehicles Source: CPG Traffic Assessment, 2009

The above data indicates that the directional traffic volume splits and percentage of heavy vehicles are similar to the VicRoads data. Additionally, the data indicates that traffic volumes have increased by approximately 5% over the past three years.

Forecast Traffic Volumes

The CPG Traffic Assessment Report, 2009 (source for the previous traffic volumes) has adopted the DOTARS 2007 Melbourne – Adelaide Corridor Strategy growth rate of 1.59%. This growth rate has a design period until 2040. To maintain consistency this growth rate has been utilised for the Western Highway EES assessment.

Based on the above growth rate and utilising the highest traffic volume count location (Western Highway west of Geelong Road), the daily two-way traffic volumes are expected to increase to 9,884 vehicles per day (vpd), for a 5-day average. The forecasted traffic volumes are presented in Table 8.

Table 8 Forecast Future Traffic Volumes (two-way direction)

Year	7 day average (veh/day)	7 day %HV	5 day average (veh/day)	5 day %HV
2012	6,105	28%	6,355	32%
2015	6,401	28%	6,663	32%
2025	7,495	29%	7,802	33%
2040	9,496	30%	9,884	33%

Source: VicRoads 2012 Data, CPG Traffic Assessment 2009 growth rate, GHD Analysis

Travel Times

While travel time data for the length of the Project has not been collected as part of this study, an assessment of travel time impacts can be derived by considering estimated travel times based on observed travel speeds.

Traffic data collected at three locations along the Western Highway reveal the mean operating traffic speed and the 85th percentile speed vary between locations; these are presented in Table 9.

Table 9 Western Highway Mean and 85th Percentile Speed

Location	Mean Speed	85th Percentile Speed
Western Highway West of Geelong Road	97.9	102.9
Western Highway between Martins Lane & Old Shirley Road	95.4	101.7
Western Highway between Heath Street & Green Hill Lake Road	83.4	92.1

Source: VicRoads, 2012

Due to this variance, to estimate travel time, it has been conservatively assumed that the average operating speed is 5 km/h below the posted speed limit at all times. This assumption has been informed by recorded mean speed at a point location and also takes into consideration vehicles slowing to enter/exit the Highway and consequently slowing vehicles travelling behind. Additionally, there were no congestion points observed during the site inspection and the traffic volumes indicate there is sufficient capacity not to create congestion along the link, therefore it has been assumed that no other delays are likely to regularly occur. Accordingly, the estimated travel time for the project length (between the railway crossing west of Beaufort and Heath Street, Ararat to a distance of approximately 38 km) is approximately 24 minutes 40 seconds.

5.3.2 Intersecting Roads

Along the length of the Western Highway, within the project area, there are a number of intersecting roads and access points. As part of CPG's Traffic Analysis Report and VicRoads Western Highway Project Proposed Operating Speed Zones Report, potential intersection treatments for the major intersecting roads have been identified.

The major intersecting roads included within one or both of these documents are listed as:

- Eurambeen-Streatham Road;
- Eurambeen-Raglan Road;
- Ferntree Gully Road;
- Goulds Road;
- Middle Creek Road;
- Main Road;
- Buangor-Ben Nevis Road;
- Gravel Route Road;

- Warrayatkin Road;
- Geelong Road; and
- Green Hill Lake Road.

The following describes the existing conditions of these roads with a focus of the roads at the intersection with the Western Highway. In addition, the access to the Ararat Aerodrome has been assessed due to the size of vehicles that may access the site. It is noted that these intersecting roads are priority controlled with the Western Highway the priority movement. Figure 2 shows the intersecting roads location in relation to the project length of the Western Highway.

The Austroads Guide to Road Design Part 4A stipulates that the Safe Intersection Sight Distance (SISD) to be provided on a major 100 km/h road (the existing speed limit of the Western Highway) at any intersection is 262 m. If and when the Western Highway is upgraded to a 110 km/h road, the required SISD is 300 m. Unless it is specifically noted, the intersecting roads have a SISD in excess of 300 m and this distance is considered satisfactory.

5.3.2.1 Eurambeen-Streatham Road

Eurambeen-Streatham Road forms a Give Way priority controlled T-intersection with the Western Highway approaching from the south. Eurambeen-Streatham Road is a two-lane, two-way sealed road with no posted speed limit, and therefore it is assumed the default rural road speed limit of 100 km/h applies. The road provides the key link between Streatham and Eurambeen and also connects the Western Highway with the Glenelg Highway. Along the Western Highway, minimal BAL and BAR treatments (refer to Section 5.1) are provided for left turning and right turning vehicles at this intersection.

Figure 5 and Figure 6 display views of Eurambeen-Streatham Road and the intersection with the Western Highway, while Figure 7 presents the overall intersection layout.

Figure 5: Eurambeen-Streatham Road, view north towards Western Highway

Figure 6: Western Highway at the intersection of Eurambeen-Streatham Road, view east

Traffic volume information for Eurambeen-Streatham Road was collected in May 2009. This data is summarised in Table 10 by direction, for average daily volumes and median peak hour volumes. The turning movements from Eurambeen-Streatham Road into the Western Highway are 18% west orientated and 82% east orientated.

Table 10 Traffic Counts: Eurambeen-Streatham Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	75 (18% HV)	76 (18% HV)	6 (8:00am-9:00am)	8 (4:00pm-5:00pm)
Southbound	82 (25% HV)	85 (25% HV)	6 (8:00am-9:00am)	8 (3:00pm-4:00pm)
TOTAL	157	161		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.2 Eurambeen-Raglan Road

Eurambeen-Raglan Road forms a Give Way priority controlled cross intersection with the Western Highway and Crockers Road, which connects to Eurambeen-Streatham Road.

Eurambeen-Raglan Road is a two-way sealed road, approximately 5 m wide, approaching the Western Highway from the north. It does not have a posted speed limit, therefore it is assumed the default rural road speed limit of 100 km/h applies. The road provides the key link between Raglan and Eurambeen with the Western Highway being the major arterial road to Melbourne.

Crockers Road is a two-way road approaching the Western Highway from the south and does not have a posted speed limit, therefore it too is assumed to have a 100 km/h limit. The road is unsealed except at the intersection with Western Highway. Crockers Road provides access to properties and connects to Eurambeen-Streatham Road and therefore, could potentially be used as a short-cut for vehicles to access the Western Highway and travel west.

Along the Western Highway, minimal BAL and BAR treatments are provided for left turning and right turning vehicles at this intersection. The intersection layout is shown in Figure 7.

Figure 8 to Figure 11 display views of Eurambeen-Raglan Road and the intersection with the Western Highway.

Figure 7: Eurambeen-Streatham Road/Eurambeen-Raglan Road/Western Highway Intersection

Figure 8: Eurambeen-Raglan Road, view north

Figure 9: Crockers Lane, view south

Figure 10: Western Highway at the intersection of Eurambeen-Raglan Road, view east

Figure 11: Western Highway at the intersection of Eurambeen-Raglan Road, view west

Traffic volume information for Eurambeen-Raglan Road was collected in May 2009. This data is summarised in Table 11 by direction, for average daily volumes and median peak hour volumes. The turning movements from Eurambeen-Raglan Road into the Western Highway are 50% west orientated and 50% east orientated.

Table 11 Traffic Counts: Eurambeen-Raglan Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	39 (7% HV)	41 (7% HV)	4 (10:00am-11:00am)	4 (5:00pm-6:00pm)
Southbound	42 (11% HV)	46 (11% HV)	6 (8:00am-9:00am)	5 (4:00pm-5:00pm)
TOTAL	81	87		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.3 Ferntree Gully Road/Goulds Lane

Ferntree Gully Road forms a Give Way priority controlled cross intersection with the Western Highway and Goulds Lane. Ferntree Gully Road is a two-lane, two-way unsealed road, except on approach to the intersection, where the road is sealed. Ferntree Gully Road is approximately 8 m wide and has no posted speed limit, therefore it is assumed the default rural road speed limit of 100 km/h applies.

Goulds Lane is a two-way unsealed road approximately 5 m wide with no posted speed limit and therefore is also assumed to have a 100 km/h speed limit. Along the Western Highway, minimal BAL and BAR treatments are provided for left turning and right turning vehicles at this intersection.

Figure 12 to display views of Ferntree Gully Road / Goulds Lane and the intersection with the Western Highway.

Figure 12: Ferntree Gully Road, view south toward Western Highway

Figure 13: Goulds Road, view south from Western Highway

Figure 14: Western Highway at the intersection of Goulds Lane, view east

Figure 15: Western Highway at the intersection of Ferntree Gully Road, view west

Traffic volume information for Ferntree Gully Road and Goulds Lane was collected in May 2009. This data is summarised in Table 12 by direction, for average daily volumes and median peak hour volumes. The turning movements from Ferntree Gully Road into the Western Highway are 50% west orientated and 50% east orientated.

Table 12 Traffic Counts: Goulds Lane, Ferntree Gully Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Goulds Lane				
Northbound	3 (33% HV)	4 (25% HV)	1 (7:00am-8:00am)	(4:00pm-5:00pm)
Southbound	5 (40% HV)	5 (40% HV)	1 (11:00am-12:00pm)	1 (4:00pm-5:00pm)
TOTAL	8	9		
Ferntree Gully Road				
Northbound	19 (5% HV)	17 (6% HV)	2 (9:00am-10:00am)	3 (4:00pm-5:00pm)
Southbound	19 (10% HV)	17 (12% HV)	3 (9:00am-10:00am)	3 (4:00pm-5:00pm)
TOTAL	38	34		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.4 Middle Creek Road

Middle Creek Road is a two-way sealed road of approximately 5 m width, with no posted speed limit. It is therefore assumed the default rural road speed limit of 100 km/h applies. Middle Creek Road forms a T-intersection with the Western Highway, approaching from the south and links Middle Creek to the Western Highway. There is a stop sign controlling access to the Western Highway where minimal BAL and BAR treatments are provided for left turning and right turning vehicles accessing Middle Creek Road.

Figure 16 and Figure 17 display views of Middle Creek Road and the intersection with the Western Highway.

Figure 16: Middle Creek Road, view south

Figure 17: Western Highway at the intersection of Middle Creek Road, view east

Traffic volume information for Middle Creek Road was collected in June 2009. This data is summarised in Table 13 by direction, for average daily volumes and median peak hour volumes. The turning movements from Middle Creek Road into the Western Highway are 80% west orientated and 20% east orientated.

Table 13 Traffic Counts: Middle Creek Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	41 (12% HV)	46 (13% HV)	4 (8:00am-9:00am)	4 (3:00pm-4:00pm)
Southbound	45 (4% HV)	49 (4% HV)	3 (11:00am-12:00pm)	6 (3:00pm-4:00pm)
TOTAL	86	95		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.5 Main Street

Main Street is a two-lane, two-way sealed road within the township of Buangor. Main Street has a posted speed limit of 60 km/h and forms a T-intersection with the Western Highway, where Main Street is Give Way priority controlled.

Within the township of Buangor, the posted speed limit for the Western Highway is reduced to 90 km/h. At the intersection with Main Street there is an AUR treatment along the Western Highway, which utilises the sealed shoulder for the additional lane. There is therefore, no shoulder for the Western Highway eastbound direction within the vicinity of the intersection with Main Street.

There is an at-grade level rail crossing on Main Street approximately 250 m south of the intersection with the Western Highway. There is signage and flashing lights at this level crossing, however boom gates are not present.

A service lane is parallel to the Western Highway, which connects to Main Street. This service lane has a posted speed limit of 50 km/h and provides access to properties and the westbound bus stop.

Figure 18 to show views of Main Street, the service road and the intersection with the Western Highway. The intersection layout is shown in Figure 22.

Figure 18: Main Street, view north

Figure 19: Service Lane, view west

Figure 20: Western Highway at the intersection of Main Street, view east

Figure 21: Western Highway at the intersection of Main Street, view west

Figure 22: Main Street/Western Highway Intersection

Traffic volume information for Main Street was collected in June 2009. This data is summarised in Table 14 by direction, for average daily volumes and median peak hour volumes. The turning movements from Main Street into the Western Highway are 39% west orientated and 61% east orientated.

Table 14 Traffic Counts: Main Street

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	6 (0% HV)	6 (0% HV)	1 (8:00am-9:00am)	1 (3:00pm-4:00pm)
Southbound	6 (0% HV)	6 (0% HV)	1 (10:00am-11:00am)	1 (3:00pm-4:00pm)
TOTAL	12	12		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.6 Buangor-Ben Nevis Road

Buangor-Ben Nevis Road approaches the Western Highway from the north and forms a Give Way priority controlled T-intersection. The road is a two-way sealed road with no posted speed limit, therefore it is assumed the default rural road speed limit of 100 km/h applies.

Buangor-Ben Nevis Road provides a link from the Western Highway to the township of Bayindeen. The sealed width of the road is relatively narrow (approximately 4 m wide), however the unsealed shoulders are wide and flat, allowing two cars to pass, in addition the road (including the pavement) flares at the intersection. Additionally, Buangor-Ben Nevis Road provides a tourist link to the Pyrenees Highway, although it is noted that north of Warrak Road, Buangor-Ben Nevis Road becomes an unsealed road.

The point at which Buangor-Ben Nevis Road intersects the Western Highway is a relatively straight section of road and therefore, there are no sight distance issues at this intersection. An AUR treatment is provided along the Western Highway for vehicles turning into Buangor-Ben Nevis Road. In May 2012 VicRoads approved Buangor-Ben Nevis Road to be a gazetted as a B-double and HML route.

Figure 23 and Figure 24 display views of Buangor-Ben Nevis Road and the intersection with the Western Highway.

Figure 23: Buangor-Ben Nevis Road, view south towards Western Highway

Figure 24: Western Highway at the intersection of Buangor-Ben Nevis Road, view east

Traffic volume information for Buangor-Ben Nevis Road was collected in May 2009. This data is summarised in Table 15 by direction, for average daily volumes and median peak hour volumes. The turning movements from Buangor-Ben Nevis Road into the Western Highway are 8% west orientated and 82% east orientated.

Table 15 Traffic Counts: Buangor-Ben Nevis Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	66 (14% HV)	65 (14% HV)	5 (11:00am-12:00pm)	9 (3:00pm-4:00pm)
Southbound	65 (11% HV)	65 (14% HV)	7 (8:00am-9:00am)	8 (3:00pm-4:00pm)
TOTAL	131	130		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.7 Gravel Route Road

Gravel Route Road is a two-way unsealed road of approximately 6.5 m width. It approaches from the south and forms a T-intersection with the Western Highway. The intersection is controlled by a Stop sign and has minimal BAL and BAR treatments provided for left turning and right turning vehicles at Gravel Route Road.

There is a private access directly opposite Gravel Route Road, however this access is minor and does not appear to be frequently used. There is no posted speed limit along Gravel Route Road and therefore it is assumed the default rural road speed limit of 100 km/h applies.

The sight distance for vehicles turning out of Gravel Route Road into the Western Highway is restricted to approximately 265 m by a curve to the west. As noted in Section 5.3.2 above, the required SISD to be provided on a major 100 km/h road is 262 m. This is therefore adequate for the existing speed limit of the Western Highway. However, if and when the Western Highway is to be upgraded to a 110 km/h road, this would no longer be satisfactory and would need to be addressed.

There is an at-grade level rail crossing on Gravel Route Road, approximately 400 m south of the intersection with the Western Highway.

Figure 25 and Figure 26 display views of Gravel Route Road and the intersection with the Western Highway.

Figure 25: Gravel Route Road, view north

Figure 26: Western Highway at the intersection of Gravel Route Road, view west

Traffic volume information for Gravel Route Road was collected in May 2009. This data is summarised in Table 16 by direction, for average daily volumes and median peak hour volumes. The turning movements from Gravel Route Road into the Western Highway are 50% west orientated and 50% east orientated.

Table 16 Traffic Counts: Gravel Route Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	18 (11% HV)	18 (5% HV)	2 (7:00am-8:00am)	2 (4:00pm-5:00pm)
Southbound	16 (6% HV)	15 (7% HV)	7 (8:00am-9:00am)	8 (3:00pm-4:00pm)
TOTAL	24	23		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.8 Warrayatkin Road

Warrayatkin Road is a two-lane, two-way sealed road with no posted speed limit, and therefore it is assumed the default rural road speed limit of 100 km/h applies. Warrayatkin Road approaches from the north and forms a Give Way priority controlled T-intersection with the Western Highway. The road provides a connection to the Ararat Motorcycle Track.

At this intersection there is a CHR treatment and an AUL treatment provided along the Western Highway for vehicles accessing Warrayatkin Road. The vertical and horizontal grades at the intersection provide for adequate sight distance.

There is an at-grade level rail crossing on Warrayatkin Road in close proximity to the intersection with the Western Highway (approximately 70 m). There is signage and flashing lights at this level crossing, however boom gates are not present.

There is an informal truck rest area immediately west of the road between the Western Highway and the rail line.

Figure 27 to display views of Warrayatkin Road and the intersection with the Western Highway.

Figure 27: Warrayatkin Road, view south towards Western Highway

Figure 28: Warrayatkin Road, view north towards railway crossing

Figure 29: Western Highway at the intersection of Warrayatkin Road, view east

Figure 30: Western Highway at the intersection of Warrayatkin Road, view west

Traffic volume information for Warrayatkin Road was collected in May 2009. This data is summarised in Table 17 by direction, for average daily volumes and median peak hour volumes. The turning movements from Warrayatkin Road into the Western Highway are 10% west orientated and 90% east orientated.

Table 17 Traffic Counts: Warrayatkin Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	57 (10% HV)	58 (12% HV)	6 (10:00am-11:00am)	5 (12:00pm-1:00pm)
Southbound	53 (15% HV)	57 (17% HV)	4 (11:00am-12:00pm)	9 (3:00pm-4:00pm)
TOTAL	110	115		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.9 Aerodrome Link

Aerodrome Link is a wide two-lane, two-way sealed road which flares at the intersection with the Western Highway to provide a left and right turn lane from Aerodrome Link. In addition, CHR and AUL treatments are provided for vehicles accessing Aerodrome Link from the Western Highway. Aerodrome Link forms a Stop priority controlled T-intersection with the Western Highway and approaches from the southern side. Aerodrome Link provides access to the Ararat Aerodrome and there is no posted speed limit for this road. In May 2012 VicRoads approved Aerodrome Link to be a gazetted as a B-double and HML route.

Figure 31 and Figure 32 display views of Aerodrome Link and the intersection with the Western Highway.

Figure 31: Aerodrome Link, view north towards Western Highway

Figure 32: Western Highway at the intersection of Aerodrome Link, view east

5.3.2.10 Geelong Road

Geelong Road provides a connection to Ballyrogan township and is a two-lane, two-way sealed road with unsealed shoulders. At the intersection with the Western Highway the intersection is a Give Way priority controlled T-intersection, with Geelong Road approaching from the south of the Western Highway. A CHR treatment is provided along the Western Highway for right turn movements into Geelong Road and a BAL treatment is provided for the left turn movement into Geelong Road from the Western Highway, where the pavement for the shoulder is widened. There is no posted speed limit for Geelong Road and therefore the default rural road speed limit of 100 km/h applies. In May 2012 VicRoads approved Geelong Road to be a gazetted as a B-double and HML route.

Figure 33 and Figure 34 display views of the Geelong Road and the intersection with the Western Highway.

Figure 33: Geelong Road, view south

Figure 34: Western Highway at the intersection of Geelong Road, view west

Traffic volume information for Geelong Road was collected in May 2009. This data is summarised in Table 17 by direction, for average daily volumes and median peak hour volumes. The turning movements from Geelong Road into the Western Highway are 90% west orientated and 10% east orientated.

Table 18 Traffic Counts: Geelong Road

Direction	Average 7-day volume (veh/day)	Average 5-day volume (veh/day)	Median Midweek AM Peak Volume (veh/h)	Median Midweek PM Peak Volume (veh/h)
Northbound	74 (9% HV)	84 (10% HV)	7 (8:00am-9:00am)	7 (5:00pm-6:00pm)
Southbound	77 (5% HV)	86 (7% HV)	6 (9:00am-10:00am)	7 (5:00pm-6:00pm)
TOTAL	151	170		

All Veh – all vehicles; HV – heavy vehicles

Source: CPG Traffic Assessment, 2009

5.3.2.11 Green Hill Lake Road

Green Hill Lake Road forms a Give Way priority controlled T-intersection with the Western Highway approaching from the northern side. Green Hill Lake Road is a two-lane, two-way sealed road with unsealed shoulders and no posted speed limit, therefore the default rural road speed limit of 100 km/h applies. CHR and BAL treatments are provided along the Western Highway for movements into Green Hill Lake Road. Green Hill Lake Road is situated close to the intersection with Geelong Road such that the right turn lanes for the two roads abut one another, therefore restricting the length of the lanes.

There is an at-grade level rail crossing on Green Hill Lake Road within close proximity to the intersection with the Western Highway (approximately 70 m). There is signage and flashing lights at this level crossing, however boom gates are not present.

Figure 35 and Figure 36 display views of the Green Hill Lake Road and the intersection with the Western Highway.

Figure 35: Green Hill Lake Road, view south towards railway crossing and Western Highway

Figure 36: Western Highway at the intersection with Green Hill Lake Road, view east

5.3.2.12 Other Minor Roads/Access Points

Along Section 2 of the Western Highway there are a number of other minor roads in addition to those discussed. The minor roads typically are two-way gravel roads providing access to properties, however the condition of these roads varies, with some having pot holes. Table 19 provides some detail of these minor roads.

Table 19 Other Intersecting Side Roads

Martins Lane Cross-section: Unsealed two-lane/two-way road (narrow) Western Highway intersection treatment: Minimal BAR and BAL
Grampians View Road Cross-section: Unsealed two-lane/two-way road (narrow) Western Highway intersection treatment: Minimal BAR and BAL
Centre Road Note: Overtaking lane in the eastern direction commence east of Centre Road Cross-section: Unsealed two-lane/two-way road Western Highway intersection treatment: Minimal BAR and BAL
Stars Road Cross-section: Unsealed two-lane/two-way road (narrow) Western Highway intersection treatment: Minimal BAR and BAL
Aherns Road Cross-section: Unsealed two-lane/two-way road Western Highway intersection treatment: Minimal BAR and BAL

P. Waldrons Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Woodnaggerak Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Mile Post Lane

Cross-section: Unsealed two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Andersons Road

Note: Forms a cross intersection

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Peakcocks Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Pope Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL, at the merge of overtaking lanes in the Western direction

Colonial Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Hillside Road (east)

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Langi Ghiran Picnic Ground Road

Note: provides entry to the Langi Ghiran State Park

Cross-section: Unsealed two-way road

Western Highway intersection treatment: Minimal BAR and BAL

Hillside Road (west) /Brady Road (fire access)

Note: Forms a cross intersection

Cross-section: Both unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL, overtaking lanes in the western direction

Dobie Road

Cross-section: Unsealed two-lane/two-way road

Western Highway intersection treatment: Minimal BAR and BAL

There are also a number of direct access points onto the road reserve of the Western Highway. These points are typically a gate or driveway at the property boundary. According to a VicRoads audit of the direct property accesses onto the Western Highway, there are 42 property access points and 8 access points to houses. These roads have not been assessed due to the limited number of vehicle movements, however alternative access arrangements would need to be provided when the Highway is upgraded to freeway conditions.

5.4 Farm Machinery

VicRoads has noted the possibility of farm machinery (e.g. tractors and loaders etc.) movements across the Western Highway. Although these movements are expected to be rare and minimal (for majority of the properties), and none were observed during the on-site observations, consideration should be given in identifying the preferred option for the Project; in particular, with reference to alternative locations for these movements and how they are managed.

During consultation, a few land owners have indicated that they currently have farm machinery movements across or along the Highway. The land parcels that would be affected include:

- Property ID: 1284 – Located west of Buangor
- Property ID: 1248, 1273, 1320, 1328, 1329, 1337 and 1338 – Located east of Ararat

5.5 Casualty Crash History

An assessment of the casualty crash history, sourced from VicRoads' CrashStats database, has been completed for the latest available five year period between 1 January 2007 and 31 December 2011. Crash data provides an indication of the road safety performance of an area, and can assist in determining existing road safety issues. The crash statistics are included in Appendix A.

The assessment was completed for the length of the Western Highway to be duplicated between Beaufort (west of Old Shirley Road) and Ararat (east of Heath Street). The assessment has also included any crashes occurring on intersecting side roads within close proximity to the Western Highway.

The review of the crash data indicates that during the five year period assessed, there have been 20 casualty crashes within the project area and these have occurred at 20 locations. A casualty crash is defined as any collision in which a police report was filed, regardless of the seriousness of the injury

The following is a summary of the 20 crashes:

- Two collisions resulted in a fatality, both of which were head on collisions;
- 11 collisions resulted in serious injury;
- 10 collisions were run-off-road crashes, with eight of these occurring on a straight section of road;
- No collisions involved pedestrians;
- Two collisions occurred at an intersections which are a ‘T’ Intersections
  - Eurambeen-Streatham Road;
  - Crockers Lane;
- There is no obvious trend for the time of day the collisions occurred; and
- 13 collisions occurred in dry conditions, while seven collisions occurred in wet conditions.

A map presenting the approximate locations of the crashes is included in Appendix A.

The crash data indicates that there have been a reasonable number of run-off-road collisions on straight sections of the road, which indicates that fatigue/driver alertness may be an issue along the length of the road. The collisions are spread along the length of the project area which indicates that a single location is not a significant road safety issue.

5.6 Bicycle and Pedestrian Infrastructure

There is no designated bicycle infrastructure on the Western Highway within the project area. There are 2.5 m sealed shoulders on the existing Highway, which may be used by cyclists, however no cyclists were observed during the on-site observations.

Children crossing warning signs are present along the Western Highway, east of Main Street Buangor. These warning signs are located near the Buangor Primary School, however no other formal crossing facilities were observed during the on-site observations. There is no other designated pedestrian infrastructure along the Western Highway within the project area.

5.7 Heavy Vehicle Facilities

Rest areas for heavy vehicles are provided in both the eastbound and westbound directions along the Western Highway. There are larger service centres near the major towns, however a majority of the rest areas are small with minimal facilities provided. Typically, the smaller rest areas are not sealed and only provide truck parking with natural shade from trees. The majority of these rest areas do not provide for amenities. The access to these facilities is typically not controlled and does not have designated access points.

Based on *VicRoads Rest Area Route Plan, Western Highway, Ballarat to Stawell* there are currently two major rest areas along the Western Highway within the project area (Section 2) that accommodate heavy vehicles, these are:

- Red Kangaroo (Red Roo) Roadhouse and United Service Centre for both directions (outside limit of works, Ch. 159600); and
- Caltex Service Centre for both directions (Ch. 195200).

In addition, there is an informal truck rest area (Ch. 161200) that can accommodate 1 – 2 heavy vehicles and a minor rest area for light vehicles (Ch. 184100).

Where the township chainages are:

- Ballarat – Ch: 112700
- Burrumbeet – Ch: 131500
- Beaufort – Ch: 156800
- Buangor – Ch: 201000
- Great Western – Ch: 217500
- Stawell – Ch: 229400

Based on the *VicRoads Rest Area Route Plan, Western Highway, Ballarat to Stawell* it is understood rest area facilities would be provided along the Western Highway as part of the Project, the location of these rest areas are discussed further in Section 6 of this report. These provisions would be in accordance with the current standards. The spacing of rest areas varies depending on the type of rest areas provided, the volume of traffic travelling along the road and the mix of traffic. As a general rule the guidelines state:

- Major Rest Areas should be located at maximum intervals of 100 km;
- Minor Rest Areas should be located at maximum intervals of 50 km; and
- Truck Parking Bays should be located at maximum intervals of 30 km.

It is expected that the access to the rest areas provided along the Western Highway would be safe and also comply with the access requirements to a freeway standard road.

5.8 Public Transport

5.8.1 Ballarat to Ararat Rail Line

The Ballarat-Ararat Rail line is a broad gauge line providing for passenger services. Within the project area, the rail line is a single bi-directional track which predominately follows the general alignment of the Western Highway.

The rail line is north of the existing Western Highway alignment within the Beaufort township. West of Old Shirley Road, Beaufort the rail follows a south-western alignment and passes under the Western Highway with a grade separated crossing. The rail line passes under the current Western Highway alignment, east of the intersection with Hillside Road (east), from where the rail line closely follows the Highway alignment on the northern side into the Ararat township.

Within the project area there are seven at-grade level crossings on intersecting roads, at the following locations:

- Andersons Road;
- Gravel Route Road;
- Langi-Ghiran Picnic Ground Road;
- Brady Road;
- Gorrin Cattle Yard Road;
- Warrayatkin Road; and
- Green Hill Lake Road.

There are currently three weekday return V/Line passenger rail services that operate between Melbourne and Ararat. All V/Line passenger services stop at Beaufort Railway Station. The times of these services are shown in Table 20.

Table 20 V/Line Rail Service Times

	From Ararat				From Melbourne		
Ararat	7.35 am	12.10 pm	4.50 pm	Melbourne	8.03 am	12.07 pm	6.24 pm
Ballarat	8.37 am	1.11 pm	5.57 pm	Ballarat	9.36 am	1.38 pm	7.45 pm
Melbourne	9.50 am	2.29 pm	7.35 pm	Ararat	10.34 am	2.34 pm	8.40 pm

5.8.2 V/Line Bus Service

Regional V/Line bus services operate within the project area along the Western Highway. There are four return weekday coach services between Ballarat and Ararat. The bus stops are located within the townships of Trawalla, Beaufort, Buangor and Ararat. Therefore, the bus stop at the Buangor Hotel is the only stop within the project area. The times of these services are shown in Table 21.

Table 21 Bus Service Times

	From Ararat to Ballarat			
Ararat	8.22 am	10.26 am	3.32 pm	
Ballarat	9.45 am	11.46 am	4.55 pm	
	From Ballarat to Ararat			
Ballarat	11.00 am	2.50 pm	6.10 pm	7.55 pm
Ararat	12.16 pm	4.06 pm	7.33 pm	9.13 pm

In addition, Ararat, Beaufort and Buangor have schools that coordinate school bus routes that operate along the Western Highway. These services are operated by Christian's Bus Company within the Section 2 project area. It is noted that school bus routes can vary annually based upon changes in student enrolment and resultant demand. Currently, there is a bus route that travels from Ararat to Warrak and return, on the return the bus travels via Buangor. Following consultation with the bus company it is understood all other bus routes do not travel within the project area.

5.9 Summary of Existing Conditions

This report has set out the existing conditions of the transport network within the project area, seeking to provide sufficient detail for the reliable assessment of impacts that may result from the proposed duplication of the Western Highway – Beaufort to Ararat.

Key findings of the existing conditions assessment include:

- The adjacent areas obtain access to the Highway along this section from a number of side roads. CHR treatments and AUL treatments facilitate access to some intersecting side roads, though commonly, no provision is made for acceleration or deceleration on the Western Highway;
- Some rural properties adjacent to the roadside have direct access to the Western Highway. These direct property accesses currently have unrestricted right-turn access;
- The percentage of heavy vehicle volumes makes up over 32% of total daily volumes, which demonstrates the Highway's importance as a freight route;
- Currently, the Western Highway is typically operating below the assessed theoretical capacity. The traffic volumes are expected to increase by 1.59% per annum. In addition, the freight task to Adelaide would also continue to increase along this corridor;
- The theoretical travel time for the length of the existing Highway between Beaufort and Ararat is approximately 24 minutes 40 seconds;
- There are limited overtaking opportunities within the project area, potentially impacting the efficiency of the Western Highway. There are overtaking lanes situated at four locations in each direction over the 38 km of Section 2 of the Western Highway Project;
- In the past five years for which there is available data, there have been 20 casualty crashes within the project area and they have occurred at 20 locations. Of these, two resulted in a fatality, 11 resulted in serious injury and run off the road type crashes were common;
- Limited regional bus services and school bus services operate on the Western Highway; and
- The Ballarat-Ararat rail line, which runs parallel to the roadside for much of the Highway, has two grade-separated underpasses of the Highway and seven at-grade crossings with intersecting side roads.

6. Impact Assessment

The detailed impact assessment documented in this report addresses the potential impacts of the construction and operation of the proposed alignments of Section 2 of the Project. The alignment(s) assessed are a culmination of progressive refinement of the design and consideration of potential impacts.

The Existing Conditions section of this report covers an area encompassing the long list of alignment options considered for the Project. Potential impacts of each option in the long list of alignments were considered in Phase 1 of the options assessment process, and were used to reduce the initial long list to a short list of alignment options.

The potential impacts of each option in the short list of alignment options were considered in more detail in Phase 2 of the option assessment process. Three proposed alignments were selected for further detailed assessment in the EES. The impacts of the proposed alignments, together with potential mitigation measures, were considered in detail through the environmental risk assessment process. The outcomes of the risk assessment process were used to finalise the proposed alignments assessed in the EES.

The proposed alignments assessed in this report are the outcome of progressive refinement through each phase of the options assessment process. The proposed alignments were also refined following the initial consideration of the environmental risk assessment.

The alignment options assessment process is described in in the 'Western Highway Project Section 2 Alignment Options Assessment Report' (February 2012). The environmental risk assessment methodology and complete risk register for all specialist disciplines is presented in 'Western Highway Project Section 2 EES Environmental Risk Assessment' (February 2012) report.

Extracts form the environmental risk register are provided in this report and the identified impacts of the preferred proposed alignments are considered in detail in the following sections.

6.1 Project Description

The Project provides two lanes in each direction and associated intersection upgrades to improve road safety and facilitate the efficient movement of traffic. It commences at the railway overpass west of Old Shirley Road, Beaufort, and extends for approximately 38 km to Heath Street, Ararat. This impact assessment includes consideration of the traffic impacts for the ultimate freeway (AMP1) standard configuration, as well as the interim upgrade to duplicated highway (AMP3), and the construction scenario.

An AMP1 (freeway) restricts access, allowing for grade separated interchanges and connecting service roads only, while an AMP3 (highway) road does not require service roads or grade separation of intersections. The posted speed is expected to be 110 km/h over the project length in the interim and ultimate operation scenarios.

The proposed upgrades to the Western Highway in the interim scenario include duplication of the highway to AMP3 standard. Wide-median treatments are proposed at Eurambeen-Raglan Road - Eurambeen-Streatham Road, Ferntree Gully Road - Goulds Lane, Peacocks Road, Hillside Extension Road, Langi Ghiran Picnic Ground Road, Hillside Road (West) and Brady Road - Warrayatkin Road.

Additionally, a wide median treatment would be provided near McKinnon Lane, which would provide access for Martins Lane, McKinnon Lane, Back Baglan Road and the existing Highway (operating as a local road for access). The majority of the remaining intersecting roads and property access would be restricted to 'left-in' and 'left-out', however a couple of roads have been truncated. Service roads are proposed to be provided to permit access for the truncated roads.

For the ultimate scenario, in the length of road from the railway overpass to approximately Ch. 800, near McKinnon Lane, there are no works proposed. Then, from Ch. 800 to Warrayatkin Road on the outskirts of Ararat, the proposed upgrade would be to freeway standard (AMP1), with the exception of the wide median treatment near McKinnon Lane. For the length of road from Warrayatkin Road to Heath Street the proposed upgrade would be to highway standard (AMP3). Grade-separated interchanges are proposed at Eurambeen-Streatham Road, Peacocks Road, Hillside Road, and Langi Ghiran Picnic Ground Road. An at-grade intersection would a wide median treatment is proposed for Warrayatkin Road.

The total width of the duplicated Highway would vary depending on topography and other constraints. This variation is typically accommodated with the median between the carriageways varying in width. Generally, the typical cross-section[1] consists of:

- Separate eastbound and westbound carriageways which each have:
  - Two lane service road approximately 10.2 m wide;
  - Outer separator between the service road and the main carriageway. This has a minimum width of 15 m; and
  - Carriageway consisting of two 3.5 m traffic lanes and a 3.0 m outer shoulder.
- The central median between the two carriageways, which has a minimum width of 15 m and includes: a 1 m median shoulder for both carriageways. Medians have been designed to be wider at designated intersection locations, where there are variations to the existing carriageway geometry or where native vegetation is to be protected within the median.

There are three potential alignment options that are being assessed. These all share a common alignment from Beaufort to near the Andersons Road intersection, east of Buangor (Ch. 16800), retaining the existing single carriageway footprint, and providing a duplicate carriageway located approximately 15 m to 100 m to the north. Thereafter, the options differ in their geometry and whether a duplication or an entirely new dual carriageway is constructed. The alignment options are summarised in Table 22 and depicted in Figure 37.

All alignment options bypass the small township of Buangor, which is currently accessed via the Western Highway. The Project proposes access to Buangor via a grade-separated interchange at Peacocks Road for the ultimate solution and a wide centre median treatment in the interim solution to the existing Highway alignment. Additionally, there is access for westbound movements to and from Buangor along the existing Highway at approximately Ch. 16000 and Ch. 20200.

There are steep grades from Beaufort through to Fiery Creek, from where the Highway has slight grades for around 18 km. To the west of Buangor the topography undulates as the Highway crosses the Ballarat to Ararat railway line and passes to the south of Langi Ghiran State Park. The Highway then levels once again from the west side of Langi Ghiran State Park through to Ararat. Apart from the State Park and

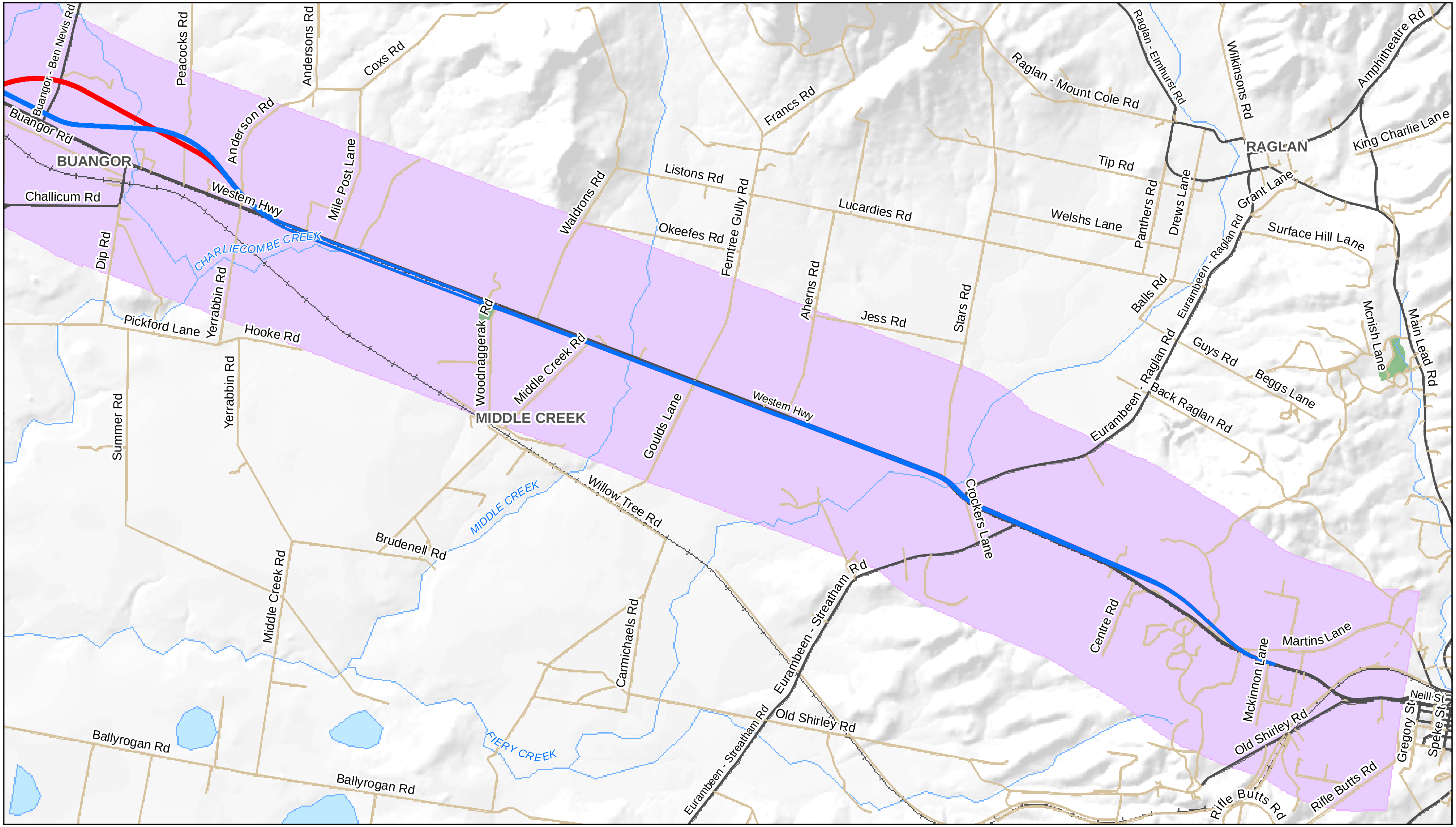
[1] Width and construction details of the service roads may vary during the detailed design stage

small areas of remnant native vegetation, the surrounding land use is predominately agricultural (grazing and cropping).

Table 22 Alignment Option Descriptions

Option	Location and Chainage (m) East to West	Description
Common to all options	Box's Cutting to Warrayatkin Road (CH. 840 to 34400)	**Duplication to AMP1 standard**
	Warrayatkin Road to Heath Street (Ch. 34400 to 39600)	**Duplication to AMP3 standard**
	Beaufort to the base of Box's Cutting (Ch. 840 - 3400)	**New dual carriageway** north of the existing highway (the existing highway would be used as a service lane) No duplication works undertaken between Ch. 0 - 840.
	Box's Cutting to Waldrons Road (Ch. 3400 – 12000)	**Duplication** of existing highway on the northern side then transferring to the southern side at Fiery Creek (Ch. 5900), with a median treatment from approximately 15 m to 30 m depending on the extent of constraints. Includes a new interchange at Eurambeen-Streatham Road / Eurambeen-Raglan Road
	Waldrons Road to east of Andersons Road (Ch. 12000 – 15700)	**Duplication** of the existing highway on the southern side, maintaining a median from approximately 15 m in the east to 40 m in the west.
Option 1	Andersons Road to Pope Road (Ch. 16500 – 22400)	**New dual carriageway** to the north of Buangor, and meeting the existing highway west of Buangor – Ben Nevis Road. Alignment common to Option 3
	Pope Road to the eastern end of Hillside Road (Ch. 22400 – 24800)	**New dual carriageway**, extending southwest from the existing highway and crossing the rail line.
	Eastern end of Hillside Road to Heath Street, Ararat. (Ch. 24800 – 39600)	**New dual carriageway** located approximately 700 m south of the existing highway until Ch. 28400 where it converges over a 1.5 km distance. A **duplication** of the existing carriageway occurs from Ch. 28400 with the new carriageway to the south. The median width varies from 30 m in the east to a narrow 6 m treatment in the west.

Option	Location and Chainage (m) East to West	Description
Option 2	Andersons Road to Pope Road (Ch. 16600 – 24600)	**New dual carriageway** that bypasses Buangor to the north, then extends south over the existing highway and rail line.
	Pope Road to the eastern end of Hillside Road (Ch. 22600 – 24200)	**New dual carriageway**, extending along the southern side of the railway line, meeting the existing highway.
	Eastern end of Hillside Road to Heath Street, Ararat. (Ch. 24200 – 39400)	**Duplication** of the existing highway on the southern side. Alignment common to Option 3.
Option 3	Andersons Road to Pope Road (Ch. 16500 – 22400)	Common alignment with Option 1 **New dual carriageway** to the north of Buangor, and meeting the existing highway alignment west of Buangor-Ben Nevis Road.
	Pope Road to the eastern end of Hillside Road (Ch. 22400 – 24800)	**New dual carriageway**, extending southwest across the rail line further than Option 2, then meeting the existing highway alignment in a similar location to Option 2.
	Eastern end of Hillside Road to Heath Street, Ararat. (Ch. 24800 – 39600)	Alignment common to Option 2. **Duplication** of the existing highway on the southern side.



Paper Size A4

0 250 500 1,000 1,500 2,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

LEGEND

- Option 1
- Option 2
- Option 3
- Study Area
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Unsealed track
- Sealed walking/bike trail
- Unsealed walking/bike trail

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vicroads

VicRoads
Western Highway Project

Beaufort to Ararat
Study Area

Job Number	31-27558
Revision	C
Date	22 Aug 2012

Figure 37A

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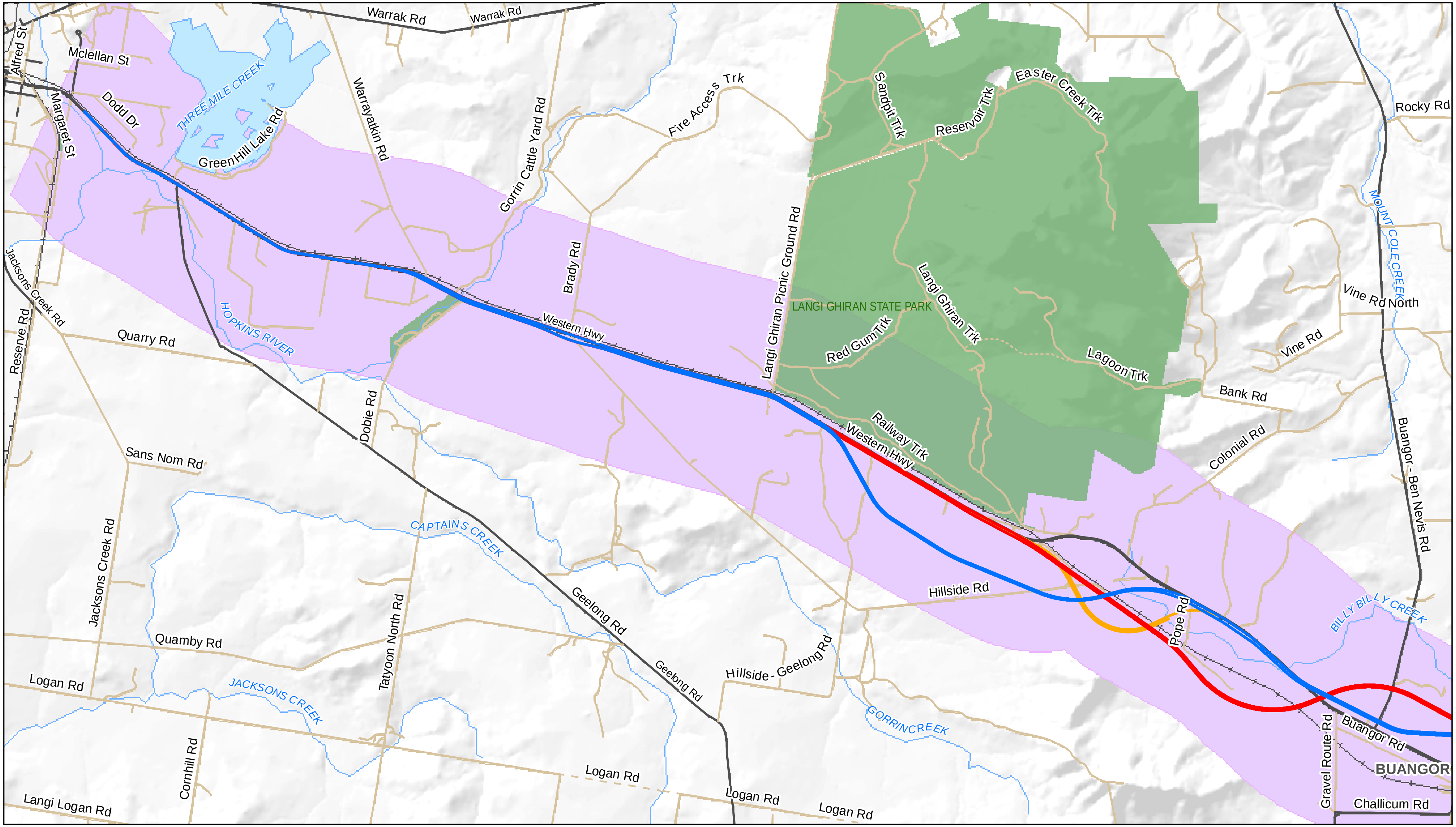
180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE, VicMap, 2012; VicRoads, 2012; GHD, Design, 2012. Created by:splaird



Paper Size A4

0 250 500 1,000 1,500 2,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

LEGEND

- Option 1
- Option 2
- Option 3
- Study Area
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Unsealed track
- Sealed walking/bike trail
- Unsealed walking/bike trail

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Western Highway Project

Beaufort to Ararat
Study Area

Job Number	31-27558
Revision	C
Date	22 Aug 2012

Figure 37B

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180 Lonsdale Street Melbourne VIC 3000 Australia T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com W www.ghd.com

Data source: DSE, VicMap, 2012; VicRoads, 2012; GHD, Design, 2012. Created by:splaird

6.1.1 Direct Property Accesses

In line with the intention for the Project to achieve AMP1 access control for the ultimate solution, access points would be via grade separated intersections with freeway standard ramps or service roads. The ultimate design would have no direct access except for the section between Hopkins River (approximately Ch. 34000) and Heath Street, Ararat which would be constructed to AMP3 access control and therefore, left-in and left-out access would be provided. Additionally, the intersection with Warrayatkin Road would be a wide median treatment.

The interim solution for the Project would have AMP3 access control for the entire length. A number of intersections would be upgraded to have a wide median treatment allowing access to/from both directions while all other intersections would be restricted to 'left-in' and 'left-out' accesses, Additionally, existing direct property accesses would be maintained, however they would be restricted to be 'left-in' and 'left-out'.

6.1.2 Bicycle and Pedestrian Paths and Crossings

The duplicated Highway is proposed to be ultimately constructed to VicRoads AMP1 standard. In rural settings, in Victoria, cyclists are generally permitted to use rural freeways, provided road access signs do not prohibit cyclists. Additionally, as stated in the VicRoads Traffic Engineering Manual, Volume 1, Section 5.4.7

> *"Rule 95(2) (Schedule 2 of Road Rules-Victoria) enables a rider of a bicycle to use an emergency stopping lane. However, it is necessary that "Bicycles Excepted" supplementary plates continue to be erected under "Emergency Stopping Lane Only" signs (in conjunction with other signs) to encourage cyclists to use the shoulders of rural freeways rather than the traffic lane."*

For the interim solution, where the Western Highway would be AMP3 standard, cyclists would be permitted to continue to use the Highway provided road access signs do not prohibit cyclists. The VicRoads Traffic Engineering Manual, Volume 1, Section 5.4.4 states

> *"Rule 317 of Road Rules – Victoria allows the highway authority to make inscriptions on signs limiting the operation of the sign in relation to classes of vehicles."*

Based on the VicRoads Access Management Policies and the Road Rules, it is anticipated that cyclists would be able to continue using the eventual Western Highway between Beaufort and Ararat for the interim and ultimate stages. The shoulder has been designed to be 3 m wide and sealed, which is sufficient width to allow cyclists to travel along the length of the Highway.

To maintain the connectivity for cyclists between Beaufort and Ararat it is essential that cyclists are permitted along the Highway. Accordingly, it would be important that this is supported by the signage used in the design.

No specific provisions have been included within the design for pedestrians. Pedestrians are not permitted to use the Highway under the road rules and would be required to use alternative roads. This is considered to be acceptable given the rural location of the Highway.

6.1.3 Rest Areas/Truck Stops

According to VicRoads Rest Area Route Plan for the Western Highway Project, the rest areas proposed for Section 2 would vary slightly for the three options, the rest areas proposed are indicated in Table 23.

Table 23 Proposed Rest Areas

Rest Area Location	Option
Red Kangaroo (Red Roo) Roadhouse and United Service Centre for the eastbound direction (Ch. 159600)	All Options
A truck parking bay west of Beaufort (Ch. 167400) for westbound traffic (this is a new rest area and would replace the existing truck parking bay at Ch. 161200)	All Options
A minor rest area at the southern border of Langi Ghiran State Park (Ch. 184100) for eastbound traffic (this rest area currently exists and can only accommodate light vehicles)	Options 2 and 3
Development of a new minor rest area slightly east of the Langi Ghiran State Park rest area as the alignment option bypasses the existing rest area	Option 1
Caltex Service Centre for both directions (Ch. 195200)	All Options

6.1.4 Lighting and Traffic Signals

Current designs indicate street lighting would be provided in accordance with Chapter 6 of VicRoads Traffic Engineering Manual Volume 1 - Traffic Management which states a specified level of lighting at intersections. Flag lighting, where one or more luminaires are provided to indicate the location of the intersection, would be provided at all wide median treatment intersections. At the grade-separated interchanges, lighting of the ramps and associated intersections is assumed to be provided in accordance with Chapter 6 of VicRoads Traffic Engineering Manual Volume 1 - Traffic Management.

No traffic signals are proposed within the project area.

6.2 Key Issues

The Western Highway Project would create both positive benefits for the State and region and some local adverse impacts. The three alignment options have been assessed, with the impacts identified being relatively similar for all options. This section provides a summary of these benefits and impacts, with further detail described in Sections 6.5, 6.6 and 6.8.

The benefits the Project would create include:

- Increased capacity along the key arterial road between Melbourne and Adelaide, which would enable this key link to accommodate the expected future traffic volumes in 2040;
- Travel time saving by not having to reduce speed though townships, having significantly greater opportunities to overtake safely and by reducing the number of intersections along the Western Highway;
- Increased safety through the township of Buangor;
- Increased safety with all key intersections becoming grade-separated for the AMP1 proposed sections (This is particularly important given the relatively high percentage of heavy vehicles travelling along the road);
- Increased safety along the route due to improved alignment, treatment of roadside hazards, provision of median, etc.;

- Improved efficiency of freight by designing to accommodate High Productivity Freight Vehicles;
- Increased provision of Clear Zones;
- Improved safety due to provision of adequate and improved rest areas; and
- Potential to reduce the traffic from local roads due to the Western Highway becoming the preferred route. This increases safety within the region as the Highway is designed to be a higher standard road and would not have at-grade intersections, when built to AMP1 standard.

The key issues the Project may create include:

- Changed road environment during construction may result in general reduction to road safety. Examples of road environment changes include heavy vehicles entering/exiting construction accesses, additional or closer roadside hazards, variable speed limits and unfamiliar conditions.
- Changed road environment during construction may result in general reduction to performance and efficiency of travel modes. Examples of road environment changes include speed reductions, works resulting in temporary road or lane closures or cumulative impacts of the simultaneous construction of multiple sections of the Western Highway;
- The duplication has the potential to disrupt local access routes post-construction; and
- Potential for some aspects of road safety to be degraded. For example, the increased crossing distance for wildlife may exacerbate frequency of accidents.

6.3 Impact Pathways

The Impact and Risk Assessment has been completed for the proposed three alignments. All impact pathways affect the three options equally. These alignments have been chosen through an options assessment process which assessed the options against the six transport system objectives and seven decision-making principles under the *Transport Integration Act, 2010*.

The traffic and transport risk and impact assessment has taken the potential effects of the Project into consideration. The risk and impact assessment has been completed for the proposed alignment for both construction and post-construction (operating) conditions.

The assessment has included consideration of:

- Construction
  - Impacts on road safety;
  - Effects on traffic operations;
  - Impact on other road users, such as public transport, school buses, emergency services, cyclists;
  - Impact on road/rail crossings and interfaces;
  - Impact on existing private accesses;
  - Impacts from potential haulage routes; and
  - High-level inputs to a Traffic Management Strategy have been developed for the proposed alignment. They seek to outline potential approaches to managing traffic during construction.
- Post-construction
  - Impacts on road safety;

- – Effects on traffic operations, including impacts within the Project area as well as consideration of impacts upstream and downstream (within the region);
- – Impact on other road users, such as public transport, school buses, emergency services, cyclists;
- – Impact on road/rail crossings and interfaces; and
- – Impact on existing private accesses and extended distances of travel for landowners.

The identified potential cause and effect pathways associated with the construction and operation of the Project include:

- Changed road environment during construction results in general reduction to road safety.
  Examples of road environment changes include heavy vehicles entering/exiting construction accesses, additional or closer roadside hazards, variable speed limits, or unfamiliar conditions.
  Impacted road users include private vehicles, public transport, school buses, cyclists and pedestrians.
- Changed road environment during construction results in general reduction to performance and efficiency of travel modes.
  Examples of road environment changes include speed reductions, works resulting in temporary road or lane closures or cumulative impacts of the simultaneous construction of three sections of the Western Highway.
  Impacted users can include private vehicles, public transport, school buses, emergency services, cyclists, pedestrians and rail.
- The Project disrupts local access routes post-construction.
- Potential for some aspects of road safety to be degraded. For example:
  - Increased crossing distance for wildlife exacerbates frequency of accidents.
  - Increased distance for farm machinery to be travelling along the road.
  - Changes in atmospheric conditions i.e. fog, sunglare (due to changes of the alignment).
- Potential for some aspects of road safety to be degraded through inadequate design, including horizontal and vertical geometry, sight distance at all intersections and merge locations (ramps and service road entry/exit).
- Traffic volumes potentially increase due to induced demand and cause congestion.

These impacts and benefits are discussed in further detail in Section 6.5 and Section 6.6.

6.4 Risk Assessment

VicRoads has a standard set of environmental protection measures which are typically incorporated into its construction contracts for road works and bridge works, hereafter referred to as the "*VicRoads standard environmental protection measures".* These are described in *VicRoads Contract Shell DC1: Design & Construct, April 2012.* These measures have been used as the starting point for the impact assessment. Those that are relevant to Traffic and Transport are included in the "planned controls" column of the risk assessment (Table 24) and outlined in more detail in Section 7.

As a result of the initial risk assessment, in some cases additional Project specific controls have been proposed to reduce risks. These are outlined in the "additional controls" column of the risk assessment in Table 24, and are described in more detail in Section 7.

Both VicRoads standard environmental protection measures and the additional Project specific controls have been included in the Environmental Management Framework for the Project.

Key observations from the risk assessment of the proposed alignments and associated construction corridor are:

- To address risks during construction, Traffic Management Plans (TMPs) would be critical to identify, assess and appropriately eliminate, reduce or mitigate road safety hazards and operational impacts in accordance with the Victorian Code of Practice for Worksite Safety – Traffic Management (2010) under the Road Management Act 2004;
- TMPs would need to provide for all travel modes, including vehicle traffic, public transport, school buses, emergency services, cyclists, pedestrians (including school students) and rail interfaces. Haulage routes would also need to be assessed;
- Road safety audits should be completed at key design phases including functional and detailed design; and
- Engagement with community and stakeholder groups as part of a broader community consultation process would be important to minimise risks to acceptable levels. This would include distribution of information regarding likely construction impacts.

A number of risks have been identified for traffic and transport, both during construction and operation of the Project. The risks affect all project options and are related to impacts to road safety, operations of the Highway and access to local roads and private properties.

All risks were assessed to have a residual risk rating of medium, low or negligible once the appropriate precautions are undertaken.

Table 24 Traffic and Transport Risk Assessment

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk			Additional Controls Recommended to Reduce Risk	Residual Risk		
				Consequence	Likelihood	Risk Rating		Consequence	Likelihood	Risk Rating
T1	Changed road environment during construction results in general reduction to road safety. Examples of road environment changes include heavy vehicles entering/exiting construction accesses, additional or closer roadside hazards, variable speed limits, unfamiliar conditions. Impacted road users include private vehicles, public transport, school buses, cyclists and pedestrians.	Increased incidence of accidents that one or more incident may result in a fatality.	Traffic Management Plans (TMPs) would need to be prepared to identify, assess and appropriately eliminate, reduce or mitigate road safety hazards and to be reviewed by VicRoads prior to implementation. TMPs to comply with standard VicRoads practices, the Traffic Management Code of Practice and the Road Management Act 2004. Examples include: speed reduction where appropriate, worksite safety barriers, advance warning signage, hazard visibility, etc. Road Safety Audits (RSAs) to be undertaken on TMPs. Project Description stipulates that construction vehicles would not typically use local roads.	Catastrophic	Unlikely	High	Haulage routes for construction traffic and heavy vehicles to be appropriately designated and managed as part of TMPs, with consideration for safety. Implement a communication strategy with the key stakeholders to manage impacts, and inform road users and the community.	Catastrophic	Rare	Medium

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Rating	Additional Controls Recommended to Reduce Risk	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Rating
T2	Changed road environment during construction results in general reduction to performance and efficiency of travel modes. Examples of road environment changes include speed reductions, works resulting in temporary road or lane closures or cumulative impacts of the simultaneous construction of three sections of the Western Highway.	Increased disruption or displacement of road users, and increased travel time and/or distance.	TMPs prepared to identify, assess and appropriately minimise likely impacts on road operations. These would comply with standard VicRoads practices, the Traffic Management Code of Practice and the Road Management Act 2004. Road Safety Audits (RSAs) to be undertaken on TMPs. Buses would be provided for rail users in the event that rail operations are temporarily suspended (in consultation with PTV, bus and rail operators).	Moderate	Likely	High	Construction to be staged to allow one carriageway to be operational at all times and traffic flow not to be stopped for any extended period of time. Consideration of non-motorised road users (ensuring connectivity is not removed), public transport, school buses, emergency services and rail interfaces. This would include: * Local community, Department of Transport and other relevant stakeholders (such as transport operators) consulted and informed of likely disruption due to construction, including impacts to public transport and school bus services.	Minor	Likely	Medium

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Rating	Additional Controls Recommended to Reduce Risk	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Rating
T2	Impacted users can include private vehicles, public transport, school buses, emergency services, cyclists, pedestrians and rail.						* Haulage routes for construction traffic and heavy vehicles appropriately designated and managed as part of TMPs, with consideration for road operations. * Impact on travel times as a result of TMP implementation to be analysed prior to, and assessed during, construction. Implementation of alternative TMP measures to be considered during construction if impacts on operations are determined to be unacceptable. * Where possible schedule construction works to minimise the impacts at public holidays, school holidays or other times when the Western Highway would reasonably be expected to experience higher levels of demand and to minimise impacts on key user groups. * Communication between construction teams from each section and integration of Traffic Management Strategies.			

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Rating	Additional Controls Recommended to Reduce Risk	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Rating
T3	The duplication disrupts/severs local access routes including cyclist connectivity post-construction (interim and ultimate operation).	Economic and social disruption through increased travel times and reduced accessibility. Vehicle traffic, public transport, school buses, emergency services, cyclists, pedestrians, rail crossings and private accesses affected.	Although local access travel distances and times may be longer, the design generally maintains access to side roads and properties during the interim and ultimate solutions. Access in the interim is via wide median treatments and 'left-in' and 'left-out access. While access in the ultimate is via service roads, except for a 5.6km section from the Hopkins River to Heath Street constructed to AMP3 standard. For this section direct access is maintained through wide median treatments, and left-in / left-out only treatments	Minor	Likely	Medium	Local community and stakeholders to be engaged and informed of positive project outcomes as part of broader community consultation process to address perceptions of localised adverse impacts. Ensure signage and design permits cyclists to continue to use the shoulder of the Highway such that it meets the Road Rule 95(2) requirements. Possible compensation through the *Land Acquisition and Compensation Act.*	Minor	Possible	Low

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Rating	Additional Controls Recommended to Reduce Risk	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Rating
T4	Potential for some aspects of road safety, during (interim) operation of the new road to be degraded. For example: -Increased crossing distance for wildlife exacerbates frequency of accidents. -Increased distance for farm machinery to be travelling along the road. -Changes in atmospheric conditions i.e. fog, sunglare. - Movements at intersections and property accesses that are retained.	Increased incidence of accidents that one or more incident may result in a fatality.	Road safety audit completed for the design.	Catastrophic	Possible	High	Assess wildlife corridors and identify mitigation measures (such as culverts) to reduce the requirement for wildlife to cross the Western Highway. Assessment of atmospheric conditions within the project area.	Catastrophic	Rare	Medium

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk: Consequence	Initial Risk: Likelihood	Initial Risk: Risk Rating	Additional Controls Recommended to Reduce Risk	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Rating
T5	Potential for some aspects of road safety, during (ultimate) operation of the new road to be degraded. For example: -Increased crossing distance for wildlife exacerbates frequency of accidents. -Increased distance for farm machinery to be travelling along the road. -Changes in atmospheric conditions i.e. fog, sunglare	Increased incidence of accidents that one or more incident may result in a fatality.	Road safety audit completed for the design.	Catastrophic	Unlikely	High	Assess wildlife corridors and identify mitigation measures (such as culverts) to reduce the requirement for wildlife to cross the Western Highway. Assessment of atmospheric conditions within the project area.	Catastrophic	Rare	Medium

Risk No.	Impact Pathway Description (how the Project interacts with assets, values and uses)	Description of consequences	Planned Controls to Manage Risk (as per Project Description, and VicRoads Contract Shell DC1: Design & Construct (April 2012)).	Initial Risk			Additional Controls Recommended to Reduce Risk	Residual Risk		
				Consequence	Likelihood	Risk Rating		Consequence	Likelihood	Risk Rating
T6	Potential for some aspects of road safety to be degraded through inadequate design, including horizontal and vertical geometry, sight distance at all intersections and merge locations (ramps and service road entry/exit)	Increased incidence of accidents that one or more incident may result in a fatality.	Appropriate standards are applied to the design. Road safety audit completed for the design.	Catastrophic	Rare	Medium	No additional controls.	Catastrophic	Rare	Medium
T7	Traffic volumes significantly increase due to induced demand and cause congestion (for the interim and ultimate solutions).	Increased travel time for road users.	Risk is negligible due to adequate capacity and no other parallel routes of the same standard road therefore no planned controls to manage risk.	Insignificant	Rare	Negligible	Risk is negligible therefore no additional controls to manage risks.	Insignificant	Rare	Negligible

6.5 Impact Assessment of Construction

This section addresses the anticipated impacts to the transport network and road users within the Project area during construction of the Project. The impact assessment presented in this section of the report was conducted on the proposed three alignments, however as previously identified, all impacts affect the three alignments equally. It is assumed that all of the mitigation measures identified in the risk assessment in Section 6.4 have been applied.

Traffic impacts considered for the construction of the Project include:

- The impacts of construction traffic on the operation and safety of the existing road network; and
- Traffic management impacts associated with the construction of new carriageways, construction sites and haulage routes.

It is expected that VicRoads would require the Construction Contractor(s) to develop a Traffic Management Strategy and detailed Traffic Management Plans (TMPs) for construction stages to provide for:

- The maintenance of appropriate levels of service to existing highway road users, local road users and adjoining land owners;
- Assessment of haulage route impacts as part of TMPs; and
- Road Safety Audits of TMPs.

The TMPs would also need to meet the requirements of VicRoads, municipal councils or other responsible authorities prior to the commencement of works. Additionally, traffic management would be required to be undertaken in accordance with established VicRoads practices, the Code of Practice for Worksite Safety - Traffic Management of the *Road Management Act 2004* and Australian Standard Manual of Uniform Traffic Control Devices, Part 3 - Traffic Control for Works on Road (AS1742.3 - 2009).

It is currently anticipated that construction of the Project would be staged to minimise disruptions and maintain traffic flow along the Western Highway in both directions. New carriageways are expected to be constructed while the existing Highway carriageway continues current operation. Where the existing carriageway is being utilised as part of the duplication, the traffic would then be transferred to the new carriageway while the existing carriageway is upgraded. Based on this staging and the width of the median, the majority of construction would be completed whilst having minimal impact on the traffic flow operation.

For the sections where construction is closer to the operating traffic lanes (i.e. where traffic is diverted from one carriageway to another or where the median is not sufficient width to provide a barrier) the typical traffic management is likely to include the installation of traffic barriers along the alignment as appropriate to separate the worksite from passing traffic, a reduction in the speed and other routine traffic management measures. It is not anticipated that much, if any, night works would be required, although these would be considered where they may mitigate the construction impacts on the community or travelling public.

However, in all cases a Traffic Management Strategy would be prepared by the contractor to provide details of the traffic management to be implemented during construction to minimise impacts and maintain traffic flow on the surrounding network. This would include details of all traffic management measures and any temporary side tracks, if required, to minimise the overall impact on the public and local community.

Generally, the construction would be expected to necessitate similar traffic management requirements within the project area, though topography and other site constraints may necessitate traffic management to be different at specific locations.

6.5.1 Construction Traffic Volumes

Traffic generated by the construction of the duplication project would principally be associated with the transport of construction machinery and equipment to site, import and disposal of materials by trucks and the removal of machinery post-construction. Traffic would also be generated by worksite contractors accessing the site across the day during a six day working week.

The volume of traffic would ultimately depend on the program and staging of construction sections, where an increased rate of construction would result in higher traffic volumes on the network each day but over a shorter overall period.

The construction of the Project is estimated to generate traffic related to the following broad construction phases:

- Set out and preparation of the construction corridor;
- Adjust or protect utilities and other services, where required;
- Complete drainage works;
- Undertake surface preparation, compaction and associated earthworks;
- Construct pavement, including batters, kerb and channel, (where required);
- Apply flexible asphalt pavement and seal treatment; and
- Apply line markings, re-vegetate and install other road furniture.

An accurate estimate of construction traffic generation cannot be made until a program and staging of construction has been developed. However, the construction of similar duplication projects typically generates the greatest traffic volumes during the earthworks and pavement construction phases, and generally less traffic volumes at other times. These two phases could be expected to generate in the order of 100 – 150 truck trips per day spread across the workday. In addition, less than 100 light vehicle trips per day would be expected to be generated by worksite contractors accessing the site, typically expected to occur during early morning and late-afternoon periods.

Based on the above, at its peak, the construction of the Project may be expected to generate in the order of 250 vehicle trip ends per day, including 150 heavy vehicles.

It is conservatively assumed that 30% of light vehicle construction traffic would occur during the peak hour, associated with worksite employees arriving and departing the site. Similarly, it is conservatively assumed that 15% of heavy vehicle traffic would occur in the peak hour, associated with an even distribution of truck movements across the workday. It is also conservatively assumed that the construction peak hours would coincide with the peak hours of the Western Highway. It is therefore estimated that the construction activities may generate up to 43 vehicle trip ends in the peak hour, including 13 heavy vehicles.

Given the existing observed peak period traffic volumes and relatively high percentage of heavy vehicle volumes on the Western Highway in the project area, as identified in Section 5.3 of this report, the additional construction traffic is not anticipated to have an unmanageable impact on the operation of the Highway. More significant impacts are likely to result from temporary changes to road environments and localised speed reductions, as addressed in Section 6.5.3 of this report.

6.5.2 Haulage Routes

The haulage routes for heavy vehicle traffic for the duplication construction would broadly be determined by the construction contractor(s). Given the connectivity of the Western Highway itself, it is anticipated that the majority of haulage would be undertaken on the Highway to the location of construction sites.

The VicRoads Heavy Vehicle Access Maps (reprinted July 2011) and Victoria Government Gazette Notice Special No. S406 - November 2009 indicate that none of the intersecting side roads to the Highway are approved as over-dimensional routes for B-Doubles and higher mass limit trucks. However according to a letter written by the VicRoads heavy vehicle policy manager to Ararat Rural City Council in May 2012 a number of roads would be Gazetted as B-double and HML routes. The roads within the project area include Buangor-Ben Nevis Road, Aerodrome Road and Geelong Road.

The declared arterial road network provides generally good localised connection within the region, including accessibility for over-dimensional vehicles. Pyrenees Highway particularly provides a good connection to the Western Highway at Ararat, while Sunraysia Highway connects to the Western Highway east of Burrumbeet. Additionally, Buangor-Ben Nevis Road and Geelong Road would also be able to be used as haulage routes given the new classification as B-double and HML routes. Haulage materials that are anticipated to be transported on the broader road network include required fill material, which would be expected to be sourced from surplus on-site materials, local quarries and borrow pits in the vicinity of the works.

The capacity of the surrounding arterial road network is anticipated to be able to accommodate construction traffic volumes, therefore not requiring local roads to be utilised. If local roads were required to be utilised to access a construction area then prior approval would be required from the road authority (i.e. VicRoads or Council) as part of the Traffic Management Plans.

It is noted that the construction may require limited transportation of oversize materials, such as bridge beams or pipelines for the road, rail and water crossings. The movement of oversize loads would be expected to have slightly different impacts, such as potential slower speeds and potential decreased opportunity for overtaking for other vehicles. The movement of loads would be expected to adhere to VicRoads general operating requirements and any required permit conditions to provide for the safe movement of the over-dimensional loads and manage the impact to other road users.

Therefore, it is considered that the arterial road network would be able to provide connection for haulage routes and hence minimise the need to operate on the local road network.

6.5.3 Road Network Impacts

It is anticipated that construction of the Project would be completed such that traffic disruptions are minimised. The duplicated carriageway would be constructed whilst maintaining current operation of the existing carriageway. Given the expected construction process and the observed peak hour traffic volumes along the Western Highway, the estimated construction traffic generation volumes are expected to be able to be accommodated along the existing alignment of the Western Highway and would be managed though a broader Traffic Management Plan for construction.

However, significant potential impacts to the Western Highway during construction are anticipated to result from the changed road environment, affecting transport operations and road safety. Specifically, these are the risks to the performance and efficiency of travel modes and a general reduction in road safety during the construction period.

By their nature, worksites in close proximity to traffic, and particularly road construction projects, generally result in non-standard road environments. Given the element of road user non-familiarity with changes to the local road environment, a higher level of driver awareness is typically required in such environments for road safety. In part to address this concern, worksites within close proximity to moving traffic would be expected to provide regulatory requirements for speed reductions.

It is likely during construction that there would be detectable adverse changes in traffic and transport conditions, including decreases in Level of Service, at multiple locations during the construction stages.

Traffic management is anticipated to provide for a range of road users including vehicle traffic, public transport, school buses, emergency services, cyclists, pedestrians (including school students) and rail interfaces to manage road network operations during construction.

Given the key requirement to maintain a safe road environment during construction, the ability to minimise impacts to transport operations on the Western Highway to an acceptable level is somewhat restricted. Effective community communication including informing of positive project outcomes would be important as part of a broader consultation process to manage road users' expectations during the construction stages. It is also proposed that consideration be given to assessing the impact to traffic operations during the construction stages and taking appropriate remedial action, if warranted.

As the construction of the duplication is expected to occur over an extended period, a comparison of the impact of construction activity during different seasons has not been undertaken. However, where possible, it is recommended that construction activity that significantly impacts on traffic operations and safety be minimised during peak seasons and holiday periods.

Further, heavy vehicles associated with construction may require access to and from the Western Highway directly from construction sites. Slow moving heavy vehicles entering or exiting the traffic stream of the Highway may have localised impacts on traffic operations. The development of suitable TMPs would help to safely and efficiently accommodate such movements.

6.5.4 Access Impacts

It is anticipated that the construction activities associated with the duplication of the Western Highway may result in some short-term disruptions to local access points. Longer-term disruptions are not expected as VicRoads requires that the construction does not unduly restrict access to properties and side roads.

Where appropriate, detour routes would be provided and are expected to be detailed in the TMPs to be prepared by the Construction Contractor(s) prior to construction. The specific impacts of the closures and subsequent mitigation measures cannot be identified until construction staging and the associated closures have been determined, therefore it is expected that these impacts would be detailed in the TMPs. Based on similar projects, it is generally considered that the impacts would be able to be appropriately managed.

6.5.5 Public Transport Impacts

Rail Line

As identified in Section 5.3, the Ballarat to Ararat rail line travels through the project area of the Project. The rail line is a single bi-directional track which predominately follows the general alignment of the Western Highway. The existing crossing (Ch 25000) would remain and would not be required to be modified as the existing carriageway at this location would not be utilised as the Western Freeway. An additional rail crossing is proposed for all three options, at Ch. 23600 for Option 1, Ch. 20800 for Option 2 and Ch. 23000 for Option 3. There is no direct interaction with the Highway as the crossing for all three options are grade-separated. As previously mentioned, there are currently three weekday return V/Line passenger rail services that operate between Melbourne and Ararat.

The construction of the new carriageway is expected to potentially impact the operation of the rail line at the location of the new grade separated crossing. The extent and duration of the impact on rail operations would ultimately depend on the construction method selected by the construction contractor(s). It is anticipated that construction would necessitate localised track occupation on the rail line for some duration, resulting in trains not being able to operate through the occupation area. To manage this impact, train replacement services would be provided for the duration of the occupation for affected V/Line passengers. It would be a requirement that relevant authorities and operators be consulted in this process and sufficient information is provided to the community.

V/Line Bus Services and School Bus Services

Regional V/Line, inter-town and school bus services operate along the Western Highway within the project area. The bus stops are located within the townships of Beaufort, Buangor and Ararat, (there are some informal bus stops along the Western Highway for the school bus). The bus services are expected to be impacted by the construction of the duplication due to an increase to travel times, decrease to travel time reliability, and a potential increase to exposure of road safety hazards from changed road environments in line with general traffic.

Speed limit reductions would be expected to be required in some areas while construction stages are undertaken. At any one time, speed reductions are expected to be localised to the area of the construction stage, rather than across the entire project area. As a result, varying degrees of travel time delays should be expected during the construction stages. However, these delays are not expected to be extensive as construction would usually be occurring away from the operating carriageway. Public transport and school bus operators may be required to allow additional journey time as part of service scheduling and would need to be consulted prior to construction.

Potential increase to exposure of road safety hazards from changed road environments during travel is expected to be addressed as part of the detailed TMPs. School bus stops currently located within the project area may need to be relocated during particular staging of the construction activities, in consultation with relevant authorities. As part of any relocation, consideration should be given to school students wanting to cross the road from bus stops. Safety considerations for temporary school bus stops and school bus stop access should be addressed as part of detailed TMPs and Road Safety Audits of such plans.

6.5.6 Other Road User Impacts

As identified in Section 5 of this report, there are limited existing formal facilities for cyclists and pedestrians along the Western Highway. Once duplicated, cyclists would be able to continue to use the sealed shoulder along the length of the Highway. During construction, all Traffic Management Plans (TMPs) would be required to consider cyclists for any construction works and should not prevent cyclists travelling along the Western Highway for any extended period of time. If cyclists would not be permitted along a section of the Highway for a short-term closure, appropriate detours and/or stakeholder consultation would be required. Localised closures of intersecting side roads and private property accesses may also impact accessibility for cyclists and pedestrians however, given the short-term nature of these closures, the impact is considered to be manageable.

Emergency service vehicles would be required to have access to properties and intersecting side roads. This access would need to be considered during the development of the detour routes and the TMPs to ensure travel times are acceptably managed. Consultation with the various emergency service bodies is recommended to understand the requirements and capabilities of the vehicles.

6.5.7 Summary of Construction Impacts

The following impacts would be expected during construction:

- Traffic generated during peak construction activities is not anticipated to have an unmanageable impact on the operation of the Western Highway;
- More significant impacts are likely to result from temporary changes to road environments and localised speed reductions, which are expected to be a regulatory requirement;
- The arterial road network is expected to provide connection and capacity for haulage routes, hence minimising operations on the local road network; and
- Accessibility consideration and detour routes, where appropriate, are expected to be detailed in TMPs to mitigate impacts to motorists, local residents, public transport services, emergency services vehicles and other road users.

6.6 Impact Assessment of Operation of Interim New Road (AMP3 only)

This section addresses the anticipated impacts to the transport network and road users post-construction within the project area as a result of the Project at the interim stage (duplicated Highway), i.e. AMP3 standard for entire length. It is assumed that all of the mitigation measures identified in the risk assessment in Section 6.4 have been applied.

The anticipated interim project outcomes are identified and road safety benefits of the duplicated Highway are described. The expected effects on operational performance of the Western Highway, road users, access, rail line interfaces and high-level traffic management principles for the interim stage of the Project are considered.

6.6.1 Capacity and Operation Impacts

The interim upgrade to AMP3 standard for the Western Highway Project, including the provision of wide median treatments at key intersections, would increase capacity and improve the operational performance of the Highway.

Following the interim duplication the theoretical capacity of the Western Highway within the project area is calculated, using the methodology detailed in Section 5.3.1, to increase from 2,473 vehicles to 4,909 vehicles per hour (for two-way traffic flow).

As outlined in Section 5.3.1, traffic volumes within the project area are predicted to grow by approximately 1.59 per cent per annum, resulting in forecast future traffic volumes as detailed in Table 8 of this report. On the basis of those forecast volumes, maximum two-way volumes are estimated to be 9,884 vehicles per day (5-day average) in 2040.

The Project is expected to provide travel time savings for vehicles travelling along the Western Highway. The theoretical travel time for the existing alignment and the three options in the interim scenario has been estimated to be:

- Existing: 24 minutes 40 seconds.
- Option 1: 22 minutes 10 seconds.
- Option 2: 22 minutes 0 seconds.
- Option 3: 22 minutes 10 seconds.

The theoretical travel time for the interim scenario has been calculated using the average speed of vehicles to be conservatively assumed to be 3 km lower than the posted speed limit as there are passing opportunities however there are at-grade intersections and property accesses which require vehicles to slow along the carriageway. The three options vary due to the length of each option.

This saving of over two minutes is expected to be accommodated through a number of aspects which include:

- The duplicated alignment allows for bypass of the township of Buangor. Currently the posted speed limit along the Western Highway reduces to 90 km/h through the Buangor township;
- An increased posted speed limit. The current limit is 100 km/h, following the upgrade the posted speed limit is expected to be 110 km/h for the 38 km length of the section; and
- The duplication provides additional overtaking opportunities which may decrease travel time for vehicles that previously were travelling behind a slow vehicle.

Highway road users are anticipated to have various benefits across the project area, including:

- Improved access and amenity for motorists;
- Improved travel time, accessibility and efficiency for road-based freight vehicles;
- Improved travel time for emergency services vehicles;
- Improved travel time for public and school buses; and
- Flow through benefits for residents, local businesses and tourist destinations through improved accessibility and travel times.

It is noted that travel times may marginally increase for some landowners due to service road access locations.

6.6.2 Road Safety Impacts

One of the key objectives and primary benefits of the Project is expected to be resultant improvements to road safety. The separation of opposing traffic movements by dual carriageways, improved safety treatments of roadside hazards, increased capacity and greater control of vehicle movements entering and exiting the traffic flow are anticipated to deliver the greatest benefits over the life of the Project.

Duplicating the Western Highway also provides increased opportunities for vehicles to pass slower moving vehicles and removes the requirement to travel on the opposing traffic lane. This is particularly important as the 5-year crash history indicates that the two accidents resulting in a fatality were head on collisions. Additionally, the increased opportunity to overtake is important as there is currently a high proportion of heavy vehicles travelling along the Western Highway (these volumes are expected to continue to increase) and these vehicles generally obstruct sight lines for vehicles passing.

Increased clear zones to the side of the carriageways, wide medians in addition to wire rope safety barriers, where warranted, would assist in reducing the severity of run-off-road type crashes, while improvements to horizontal alignment are anticipated to assist in reducing the likelihood of run-off-road type crashes. Where topography is suitable, the duplication has been designed to accommodate a 10 m clear zone on either side of the edge of the traffic lanes (inclusive of pavement areas for the inner and outer shoulders of the carriageway). Where this cannot be achieved wire rope safety barriers would be provided to shield from the obstructions. The clear zone is generally a 10 – 13 m area for areas of fill and 7.5 – 8.5 m for areas of cut. The clear zone is measured from the edge of the carriageway that is to be kept clear from obstructions, such as trees and utilities (however the clear zone does vary slightly depending on the road design speed). In many cases the maximum construction footprint would extend past the clear zone boundary to accommodate roadside design elements such as batter slopes and utility services.

Overall improvements to the horizontal and vertical alignment of the Western Highway are expected to improve sight distances, particularly at intersections with wide median treatments, with benefits along the length of the Highway.

The Western Highway Project (for all options) also involves a bypass of the township of Buangor. Diverting through traffic from the township is expected to improve road safety for all road users within the township, particularly given the high proportion of heavy vehicles travelling along the Highway.

The Western Highway Project alignment generally follows the existing Highway alignment with the exception of the Buangor bypass to the north of the township and potentially in the vicinity of Langi Ghiran State Park. Consequently, the Highway is generally aligned to be east-west. As the alignment is not proposed to alter significantly and the bypass has sections aligned north-south, factors effecting driver performance (i.e. sun glare) are not expected to significantly alter from existing conditions. Given the 5-year crash history of this section of the Western Highway did not indicate any significant trends related to this type of collision further detailed consideration is not deemed to be warranted.

Whilst considered in a general sense, an assessment on the location of fog along the alignment has not been completed, and accordingly this would need to be considered during the detailed design stages of the Project. However, if fog does occur along a section of the alignment then the duplication is anticipated to provide an improved road safety outcome from the existing conditions. This improvement would primarily be due to the road being divided and therefore the risk of veering into oncoming traffic is significantly reduced due to the presence of the centre median. Additionally, the upgrade would allow for improved delineation (including improved line marking) of areas prone to be affected by fog.

Estimate of Road Safety Benefits

The road safety analysis involved quantifying the road safety benefits due to the Project, taking into consideration local conditions. This has been carried out in accordance with Austroads Guide to Road Safety Part 8: Treatment of Crash Locations, where the crash reduction rates for treatments have been obtained from Table 9.5 and Table 9.6. The past five years of historical casualty crash data within the project area, as presented in Section 5.5 of this report, has been analysed to determine the expected casualty crash savings resulting from the Project.

Based on the crash history of the existing road and the crash reduction factors for each proposed treatment, it is estimated that the crashes per 100 million km travelled per year would reduce from 5.5 to 3.94 for the interim scenario. Hence, the Project is anticipated to substantially reduce the incidence of casualty crashes in the project area.

Road User Fatigue

Driver fatigue is a significant factor of driver deaths in Victoria each year. According to the Melbourne-Adelaide Corridor Strategy, this is specifically the case for the Western Highway. Forty-five per cent of the 805 casualty crashes that occurred on the Victorian section of the Western Highway (between 1 January 2000 and 31 December 2004) were recorded to be run-off-the-road crashes and head-on collisions, which are common indicators in fatigue related crashes. Therefore, it is important to provide rest area facilities where drivers can stop and take a break from driving.

Additionally, the Western Highway has a relatively high percentage of heavy vehicles travelling along the road and rest areas are required to enable these drivers to meet the regulatory requirements enforced on the freight industry.

The duplication of Section 2 of the Western Highway proposes to include at least one rest area for both carriageways. The number of rest areas was established based on the '*Western Highway Project- Rest Area Route Plan May 2011*'. Additionally, the spacing between rest areas meets the ‘National Transport Commission’s National Guidelines for the Provision of Rest Area Facilities (January 2004)’.

The national rest area guidelines categorise rest areas into three types based on the facilities provided. These are major, minor and truck stop. The interval requirements between the rest area categories vary, where:

- A major rest area is required every 100 km;
- A minor rest area is required every 50 km; and
- A truck stop is required every 30 km.

For situations where drivers do not break when fatigued, the VicRoads Arrive Alive 2008-2017 strategy outlines measures to reduce the incidence and severity of fatigue related crashes. Specifically,

> “*designing and modifying roads and roadsides to address head-on and run-off-road crashes through treatments such as road duplication, roadside and centre-road barriers, centre-road rumble lines, overtaking lanes and removal of roadside hazards such as trees and poles*” (VicRoads 2008).

Notably, the Project proposes to incorporate several of these design elements that would be expected to reduce the incidence and severity of fatigue related crashes within the project area. This analysis has been incorporated in the estimate of road safety benefits.

6.6.3 Road Network Impacts

The interim stage of the Western Highway Project would involve duplication of the existing Highway, which results in slight realignment of the Highway for a proportion of the project length to accommodate the increased road width. During the interim stage there would be no grade-separated intersections and most of the existing local intersecting side roads and properties which currently have access to the Western Highway would have 'left-in' and 'left-out' access to the Highway. Where the existing Highway is not being utilised as part of the Project the road would remain and operate as a service road to provide access for local roads and properties adjacent to the existing Highway.

To provide access and improve road safety for the Western Highway Project a number of intersections are proposed to be upgraded to be wide-median treatments during the interim stage of the Western Highway Project. It is understood that the design for these intersections would make provision for heavy vehicles in a manner which is consistent with consideration for road safety. The intersections which would be upgraded to have a wide median treatment include:

- Eurambeen-Raglan Road – Eurambeen-Streatham Road. Note access to Crockers Lane is via this intersection;
- Ferntree Gully Road – Goulds Lane;
- Peacocks Road;
- Hillside Extension Road;
- Langi Ghiran Picnic Ground Road;
- Hillside Road (West) and Brady Road; and
- Warrayatkin Road.

Additionally, Martins Lane, McKinnon Lane, Back Baglan Road and the existing Highway (operating as a local road for access) would have access to the upgraded Western Highway via a wide median treatment and service road connections.

Within the vicinity of the Buangor bypass a number of intersecting side roads would have direct access to the Highway removed. Access to these roads would be provided through connections to Peacocks Road wide median treatment via a service road or along the existing Highway. This access arrangement is likely to increase travel time for users, however it is expected to be acceptable. The intersecting side roads proposed to have direct access removed include:

- Anderson Road;
- Buangor-Ben Nevis Road;
- Yerrabbin Road;
- Main Street; and
- Gravel Route Road.

Intersecting side roads without a wide median treatment or alternative access arrangements and properties which currently have direct access onto the Western Highway, would be restricted to the 'left-in' and 'left-out' access. This is anticipated to increase the travel time for one direction of travel as vehicles would be required to travel along the Highway until the nearest wide median intersection treatment or median break. The proposed roads to have' left-in' and 'left-out' access include:

- Stars Road;
- Aherns Road;
- Middle Creek Road;
- Waldrons Road;
- Mile Post Lane;
- Dobie Road;
- Aerodrome Link.
- Geelong Road; and
- Green Hill Lake Road.

Woodnaggerak Road would have access to the Western Highway removed, however access would be provided via Middle Creek Road as the two roads intersect south of the Western Highway. This access arrangement is likely to result in slightly increased travel times however, given the expected low volumes, the impacts are expected to be manageable.

Pope Road and Colonial Road are proposed to have slightly different access arrangements to the upgraded Highway for each option. These are:

- **Option 1**
  - Pope Road would have a 'left-in' and 'left-out' access directly onto the upgraded Western Highway.
  - Colonial Road would access the upgraded Western Highway via the existing Highway which is not proposed to be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements could access the upgraded Western Highway via the wide median treatment at Hillside Road.
- **Option 2**
  - Pope Road and Colonial Road would access the upgraded Western Highway via the existing Highway which would not be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements could access the upgrade Western Highway via the wide median treatment at Hillside Road.
- **Option 3**
  - Pope Road would have a 'left-in' and 'left-out' access directly onto the upgraded Western Highway.
  - Colonial Road would access the upgraded Western Highway via the existing Highway which is not proposed to be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements could access the upgraded Western Highway via the wide median treatment at Hillside Road.

Direct Property Accesses

Existing direct property accesses to the Western Highway would typically be maintained, however the majority would be restricted to be 'left-in' and 'left-out'. To access those properties from the opposing direction, to the permitted access, vehicles would be required to travel to the nearest wide median treatment or median break and complete a 'U-Turn'.

Given the 'left-in' and 'left-out' access restriction to the Highway, vehicles associated with direct property access may be required to drive further in order to drive in their desired direction of travel. The effect may be an increased travel time for those road users, with the actual extent depending on the destination of travel. Based on the typical distances of travel for the project area, the increase in travel time is not considered to be an unreasonable change in order to achieve desired road safety benefits.

As part of the Road Safety Audit process in the detailed design of the duplication, the impact of vehicles exiting properties onto the Western Highway and the provision for specific vehicle types such as horse floats and farming machinery, through gentle acceleration and deceleration at such locations, should be considered.

6.6.4 Public Transport Impacts

Rail Line

As previously mentioned, the Ballarat-Ararat rail line crosses the Western Highway Project once and the location is slightly different for Option 2 compared to Options 1 and 3. The rail crossing in all options is grade-separated.

The rail line crosses Langi Ghiran Picnic Ground Road, Brady Road, Warrayatkin Road and Green Hill Lake Road within the vicinity of the duplication project area. These crossings are not proposed to be altered or moved for the interim solution and are located at the edge of the project area. Consequently, it is anticipated that the Western Highway upgrade would have minimal impact on the safety and operation of the rail line, however it is recommended a Road Safety Audit be undertaken during the design process.

Bus Services

Regional V/Line bus services are anticipated to benefit from improved travel times and travel time reliability along the length of the Western Highway within the project area, in line with general traffic. Within the project area the only designated V/Line bus stop is in the township of Buangor. Given the duplicated Highway is proposed to bypass the township and the existing Highway would be maintained for use within the township the existing bus stops would not be affected. Therefore, it is expected that there would be negligible impacts to the bus services or public transport users.

School bus service routes managed by the Department of Transport (DOT) are noted to change on an annual basis due to changes in student enrolment and resultant demand, which ultimately affects the location of school bus stops. Currently, any new bus stop undergoes assessment with consideration of safety by the DOT in consultation with VicRoads. The location of school bus stops currently adapts to the existing built environment to service school bus demand catchments.

Following the duplication of the Western Highway, the proposed location of bus stops would need to consider how pedestrians can safely access the bus. If stops are maintained along the Highway and no formal pedestrian crossing facilities are provided, pedestrians would only legally be able to access the bus from one side of the road as they are not permitted to cross the Highway. It is anticipated one of two impacts would occur for pedestrians' access to the bus service:

- The bus route is altered to ensure passengers are able to be picked-up/dropped on both sides of the Western Highway without the need to cross. This is likely to increase travel time for the bus and passengers; or
- If buses are not able to return passengers to the side of the Highway that they were picked up from, this may lead to pedestrians crossing the Western Highway illegally, which is a road safety issue. This is not considered to be an acceptable outcome and therefore the future bus routes and bus stop locations for the school bus would need to consider accessibility to the stops for pedestrians.

The Project would necessitate consideration by DOT for the potential relocation of school bus stops within the project area. Consideration should be made to providing adequate allowance for a bus to pull off the Highway and waiting areas for students and vehicles, and the ability for pedestrians to safely access the bus.

6.6.5 Other Road User Impacts

Cyclists and Pedestrians

Within the design, for the AMP3 (highway interim solution, no specific provision is made for cyclists and pedestrians, however cyclists would be permitted to use the sealed shoulder of the highway. Connectivity for cyclists to the highway would be impacted by the Project, particularly due to the 'left-in' and 'left-out' restriction, however cyclists would have the same level of access as other vehicles.

The centre median is expected to have wire rope barriers in sections where the clear zone requirements cannot be met; hence this may reduce the opportunity for mid-block crossing of the Highway. Pedestrian and cyclist activity is currently minimal and the duplication is not expected to increase the level of activity.

Provided cyclists can be permitted to use the sealed shoulder of the highway, it is anticipated that pedestrians and cyclists would adjust to the changed built environment and the impact is considered to be minimal.

Emergency Service Vehicles

It is anticipated that there would be positive and negative impacts to emergency service vehicles due to the duplication of the Highway. It is expected emergency service vehicles would benefit from the increased capacity along the Highway and the increased ability to safely overtake other vehicles.

The decreased local accessibility due to the presence of the centre median i.e. 'left-in' and 'left-out' restriction at a number access points, is likely to result in increases to the distance travelled for the emergency service vehicle. The wide median intersection treatments have been designed at regular intervals for the key intersecting side roads and therefore, the Project is not considered to adversely impact emergency service vehicles.

Horses, Livestock and Farming Machinery

The movement of livestock across the highway may be permitted via livestock underpasses. It is understood that there are currently no livestock crossings across the Western Highway within the project area. Therefore, the upgrade of the Western Highway is not considered to be an issue for livestock crossings.

The movement of farm machinery permitted on public roads under *Road Safety (Vehicles) Regulations 2009* (including tractors) would be allowed along the duplicated Highway (AMP3), subject to appropriate vehicle registration and permits, if required. To access opposite sides of the highway, farm machinery vehicles would be required to utilise the existing highway, some new service roads and the at-grade intersections. This would result in increased travel times however, given there are only few property owners who own property on both sides of the highway, the impact is considered to be manageable.

Heavy Vehicles

The Western Highway is a key freight route between Melbourne and Adelaide and consequently, has a high proportion of heavy vehicles travelling along the road. As previously mentioned, the duplicated Highway would be designed to accommodate High Productivity Freight Vehicles (HPFVs). This would provide the industry the opportunity to improve efficiency of freight movements by increasing the volume transported by a single vehicle. Improved efficiency of freight movement benefits the State through reduced transport costs and benefits the local area by reducing the overall number of heavy vehicles required to be travelling along the Western Highway.

The Project would provide travel time savings for freight vehicles through reduced delays due to a reduction in at-grade intersections and access points and improved overtaking opportunities. Additionally, the duplication would provide opportunities for heavy vehicles to safely pass or be passed along the length of the project area.

6.6.6 Interim Duplication Impact Assessment Summary

The interim solution of the Western Highway Project would be expected to have the following impacts:

- Improved road safety across the project area through:
  - Increased clear zone widths;
  - Wide median intersection treatments at key intersection to improve sight distance and stage movements;
  - Ability for drivers to safely over take vehicles along the length of the Project;
  - Bypassing the township of Buangor; and
  - Providing adequate rest areas facilities that comply with the rest area guidelines.
- Improved traffic operation through:
  - Reduction of access points;
  - Opportunities to over take along the length of the Project;
  - Increased posted speed limit; and
  - Increased capacity to accommodate future traffic volume growth.
- Improvements to the freight task by designing the road to accommodate high productivity freight vehicles thereby allowing:
  - Improvements to efficiency of the freight task by transporting a greater volume in a single vehicle;
  - Reducing the overall heavy vehicle volume by vehicles having the ability to transport a greater volume; and
  - Travel time savings for freight vehicles due to a reduction in at-grade intersections and access points and improved overtaking opportunities.
- Access for intersecting side roads and direct property access is generally maintained through the provision ‘left-in’ and ‘left-out’ access arrangements. There are expected to be some localised

impacts on travel times for landowners, due to increased travel distance for one direction of travel. However, overall benefits for road safety and Highway operations would be provided for general users.

- Minimal impacts to the operation of the rail due to the Project, as the Highway and rail line would continue to be grade separated.
- Travel time savings for bus routes travelling along the Highway.

6.7 Impact Assessment of Operation of Ultimate New Road (AMP1 and AMP3)

This section addresses the anticipated impacts to the transport network and road users post-construction within the project area as a result of the ultimate Project (upgrade to freeway-AMP1-standard). It is assumed that all of the mitigation measures identified in the risk assessment in Section 6.4 have been applied.

The anticipated ultimate project outcomes are identified and road safety benefits of the duplication are described. The expected effects on operational performance of the Western Highway, road users, access, rail line interfaces and high-level traffic management principles for the ultimate project are considered.

6.7.1 Capacity and Operation Impacts

The capacity and operational impacts due to the Western Highway Project are generally expected to be the same for the interim and ultimate solutions. Although the ultimate solution would have some grade-separated intersections and restricted access to the freeway, the operational impacts are expected to be similar to the interim solution. Traffic volumes indicate that there would be sufficient capacity that grade-separated intersections would not significantly improve the operation of the Western Highway.

The Project is expected to provide further travel time savings (in addition to the travel time savings gained in the interim solution) for vehicles travelling along the Western Highway for the ultimate scenario. The additional travel time savings would be gained through the restricted access arrangements as this would reduce the need for drivers to slow for vehicles entering or exiting the road. The theoretical travel time for the existing alignment and the three options in the ultimate scenario has been estimated to be:

- Existing: 24 minutes 40 seconds.
- Option 1: 21 minutes 40 seconds.
- Option 2: 21 minutes 30 seconds.
- Option 3: 21 minutes 40 seconds.

The theoretical travel time for the ultimate scenario has been calculated using the average speed of vehicles to be assumed to be the posted speed limit as there are passing opportunities and all access is via grade-separated interchanges which would not require vehicles to slow along the carriageway. The three options vary due to the length of each option.

Refer to Section 6.7.2 for other details on capacity and operational impacts.

6.7.2 Road Safety Impacts

As mentioned in Section 6.6.2, one of the key objectives and primary benefits of the Project is expected to be resultant improvements to road safety. The road safety impacts of the ultimate upgrade of the Western Highway would be similar to the impacts of the interim upgrade, however there likely to be additional benefits for the ultimate upgrade.

The benefits associated with separating opposing traffic movements by dual carriageways, improved treatments of roadside hazards, increased capacity and greater control of vehicle movements entering and exiting the traffic flow would be similar for the interim and ultimate solutions. Additionally, the alignment of the Western Highway would be similar for the interim and ultimate solutions and therefore would also have the same road safety impacts associated with the town bypass of Buangor and the environment i.e. sunglare and fog. Refer to Section 6.6.2 for discussion of these impacts.

The major difference between the interim and ultimate solutions in regard to road safety impacts is access to the freeway, which is limited to grade-separated interchanges, and service roads provide access to the local road network and adjacent properties. The ultimate design of the Western Highway Project provides improvements to the horizontal and vertical alignment which are expected to improve sight distances, with benefits along the length of the Highway. In particular, the realignment and grade-separation of the Eurambeen-Streatham Road/Eurambeen-Raglan Road intersection would improve the sight distance and vehicle access to the intersecting roads from the Highway. The proposed alignments also propose to grade-separate a number of intersections, some with ramp access to the Western Highway and others which do not provide access to the Highway. Grade-separating these intersections would reduce the potential conflicts at the intersections. The intersections which would be grade-separated and have access to the Western Highway include, Eurambeen-Streatham Road/Eurambeen-Raglan Road, Peacocks Road, Hillside Road and Langi Ghiran Picnic Ground Road. The Ferntree Gully Road/Goulds Lane intersection is proposed to be grade separated however access to the Western Highway is not proposed.

Additionally, within the ultimate solution, the at-grade rail crossing at Langi Ghiran Picnic Ground Road is proposed to be removed. This would improve road safety at this location by removing a conflict point.

Estimate of Road Safety Benefits

The road safety analysis involved quantifying the road safety benefits due to the Project, taking into consideration local conditions. This has been carried out in accordance with Austroads Guide to Road Safety Part 8: Treatment of Crash Locations, where the crash reduction rates for treatments have been obtained from Table 9.5 and Table 9.6. The past five years of historical casualty crash data within the project area, as presented in Section 5.5 of this report, has been analysed to determine the expected casualty crash savings resulting from the Project.

Based on the crash history of the existing road and the crash reduction factors for each treatment, it is estimated that the crashes per 100 million km travelled per year would reduce from 5.5 to 3.37 in the ultimate scenario. Hence, the ultimate Project upgrade is anticipated to substantially reduce the incidence of casualty crashes in the project area.

Road User Fatigue

As previously mentioned, driver fatigue is a significant factor of driver deaths in Victoria each year. The ultimate design of Western Highway Project is expected to have the same number and type of rest area provisions as the interim solution. Therefore, for discussion on the location and impacts to road user fatigue refer to the discussion in Section 6.6.2.

6.7.3 Road Network Impacts

The existing intersecting side roads to the Western Highway within the project area would generally be retained by the Project through grade separated intersections or service roads, with minor impacts on local access and connectivity. The duplication project is predominantly designed in accordance with AMP1. In relation to intersecting side roads, the design would provide a high level of control over access points, vehicle turns and crossing movements.

As previously mentioned, Eurambeen-Streatham Road/Eurambeen-Raglan Road, Hillside Road and Langi Ghiran Picnic Ground Road intersections would all be-grade separated with ramp access to the Western Highway for all movements. It is understood that the design for these intersections would make provision for heavy vehicles, which is consistent with consideration for road safety.

The interchange for Peacocks Road would be a half diamond interchange only allowing for access and egress from the eastbound carriageway. Access and egress to the westbound carriageway would be provided either side of Bunagor township where the existing Highway alignment connects with the proposed bypass alignment. Therefore vehicles with a desired destination of Buangor township, Peacocks Road, Buangor-Ben Nevis Road or Gravel Route Road and travelling west would be required to exit from the freeway at Yerrabbin Road. While vehicles with an origin at any of these locations with a destination to the west of Bunagor would be required to travel through Buangor and access the freeway west of Gravel Route Road.

Vehicles travelling between Bunagor-Ben Nevis Road and the Western Highway would be impacted by increased travel times due to this access arrangement. Vehicles travelling to or from the east would not be significantly impacted as a new road link between Bunagor-Ben Nevis Road and Peacocks Road would be provided. However, travel time for vehicles travelling from Buangor-Ben Nevis Road to travel westbound along the Western Highway would increase. These vehicles would be required to travel to the Peacocks Road interchange to access the existing Western Highway alignment and then through Buangor township.

Based on traffic counts from CPG, 2009 there are on average 131 vehicles per day (approximately 14% heavy vehicles) travelling along Buangor-Ben Nevis Road, of this total 12 vehicles complete the south-west movement (right turn from Bunagor-Ben Nevis Road onto Western Highway travelling west). Accordingly, there may be some heavy vehicles travelling through the Buangor township as a result of the proposed access arrangements. It is also noted that Bunagor Ben-Nevis Road has been gazetted as a B-double and HML Route by VicRoads in May2012 and consequently the number of heavy vehicles may increase, however the volume would be significantly lower than the volume currently travelling along the Western Highway through the township. Based on the current average 7-day volume along Buangor-Ben Nevis Road this access arrangement, which is considered to be acceptable.

To enable access to be provided to the Western Highway whilst minimising the number of access points two-way services roads have been incorporated within the design. These service roads do not connect the entire 38 km length of the Highway, however the service roads have been located to ensure intersecting side roads and properties can maintain appropriate access. Intersecting side roads and properties which have a nearby and relatively convenient connection to another road which has a connection to the Western Highway would not have service road access. The following intersections, common to all options, would be provided with access to the Western Highway via a service road:

- Grampians View Road;
- Back Baglan Road;
- Centre Road;
- Stars Road;
- Aherns Road;
- Waldrons Road;
- Mile Post Lane;
- Anderson Road;
- Buangor-Ben Nevis Road;
- Hill side Road (west);
- Brady Road; and
- Dobie Road.

A few intersecting side roads are not proposed to have service road access. These roads and the accesses provided include:

- Crockers Lane does not need a service road connection as it also connects to Eurambeen-Streatham Road and therefore, can connect to the freeway via the Eurambeen-Streatham Road/Eurambeen-Raglan Road interchange;
- Goulds Lane/Ferntree Gully Road intersection would be grade-separated without access to the Western Highway. However, there is proposed to be a service road access to both Eurambeen-Streatham Road/Eurambeen-Raglan Road and Peacocks Road interchanges;
- Yerrabbin Road and Gravel Route Road would both connect to the existing Western Highway on the outskirts of the Buangor Bypass. Peacocks Road interchange is proposed to provide access for all movements to both roads. In addition, there is a second proposed access to the existing Highway from the upgraded Western Highway for westbound movements and a second access from the existing Highway to the upgraded Western Highway for westbound movements;
- Middle Creek Road and Woodnaggerak Road are not proposed to have direct access or service road access to the Western Highway. However, both roads would connect to Goulds Lane through the existing road network;
- Warrayatkin Road is proposed to have a wide median treatment which provides for all movements and all vehicle types; and
- Geelong Road, Aerodrome Link and Green Hill Lake Road are proposed to have 'left-in and left-out' access to the Western Highway.

Additionally, a wide median treatment is proposed to be provided at the commencement of Section 2 duplication (approximately Ch. 1200). This treatment would enable a direct access route to Beaufort for local traffic and reduce the requirement for traffic to travel west to the Eurambeen-Streatham Road/Eurambeen-Raglan Road interchange. Service road connections to this wide median treatment would also be provided for Martins Lane and McKinnon Lane. It is currently understood that the wide median treatment would not be able to accommodate vehicles greater than 15 m in length, which would permit buses to use the access. Large trucks would not be able to utilise this access point and would be required to travel to the Eurambeen-Streatham Road/Eurambeen-Raglan Road interchange. While this is not a direct route, it is not anticipated to be a significant issue as the number of large vehicles requiring to complete this movement is expected to be minimal.

Pope Road and Colonial Road are proposed to have slightly different access arrangements to the upgraded Highway for each option. These are:

- **Option 1**
  - Pope Road is proposed to have a service road connection to the existing Highway slightly east of western end of Buangor Bypass. This would provide direct access onto the upgraded Western Highway for westbound movements with all other movements being accommodated via Peacocks Road interchange on the eastern side of Buangor township.
  - Colonial Road is proposed to access the upgraded Western Highway via the existing Highway which is not proposed to be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements would be able to access the upgraded Western Highway via the Hillside Road interchange.
- **Option 2**
  - Pope Road and Colonial Road are proposed to access the upgraded Western Highway via the existing Highway, which is not proposed to be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements would be able to access the upgrade Western Highway via the Hillside Road interchange.
- **Option 3**
  - Pope Road is proposed to have a service road connection to the existing Highway slightly east of the western end of Buangor Bypass. This would provide direct access onto the upgraded Western Highway for westbound movements, with all other movements being accommodated via Peacocks Road interchange on the eastern side of Buangor township.
  - Colonial Road is proposed to access the upgraded Highway via the existing Highway that would not be utilised as part of the upgrade. The existing Highway would connect to the upgraded Western Highway directly for the eastbound movements, while westbound movements would be able to access the upgraded Western Highway via the Hillside Road interchange.

While Hillside Road (west) and Dobie Road are proposed to have a service road connection between the two roads, the connection to the Highway would not be direct. There are a couple of options for connections, however the likely access for these roads would be the via the Hillside Road interchange for movements to/from the east and via Geelong Road for movements to/from the west. Whilst the removal of these connections may require a detour of up to 10km, this is not considered to be unreasonable in this instance, given the low volume of traffic that would be impacted and that the alternate routes generally head in the same direction as the Highway (i.e. there is not an unreasonable amount of 'back-tracking' required).

The overall impact of service road treatments and intersection closures is anticipated to provide improvements to road safety and traffic operations on the Western Highway with limited impact on local access as the road network provides other connections.

It is therefore concluded that access for intersecting side roads to the Western Highway within the Project area would generally be retained by the Project, with only minor impacts on connectivity and travel times. As part of the community consultation process, raising awareness of positive project outcomes resulting from service road treatments and intersection closures would be addressed.

Direct Property Accesses

Access to the Western Highway from properties with existing access would be maintained, via service roads or the local road network which has a connection to the Western Highway, as part of the Project to ensure access for adjacent landholders. A further review and final access arrangements are anticipated to be addressed through detailed design.

Given the restriction of access to the Highway at grade-separated interchanges, only individuals that currently have direct property accesses may be required to drive further in order to drive in their desired direction of travel. The effect may be an increased travel time for those road users, with the actual extent depending on the destination of travel. Based on the typical distances of travel for the project area, the increase in travel time is not considered to be an unreasonable change in order to achieve desired road safety benefits.

At this level of investigation, it is expected that the restriction to service road access for property accesses would improve road safety for landholders and other users of the Western Highway. As part of the Road Safety Audit process in the detailed design of the Project, the impact of vehicles exiting properties onto service roads and the provision for specific vehicle types such as horse floats and farming machinery through gentle acceleration and deceleration at such locations should be considered.

6.7.4 Public Transport Impacts

Rail Line

As previously mentioned, the Ballarat-Ararat rail line crosses the ultimate Western Highway Project once, with the location varying slightly for Option 2 compared to Options 1 and 3. The rail crossing in all options is grade-separated.

Additionally, the Project reduces the number of side road crossing points of the railway within the vicinity of the project area to be only Warrayatkin Road and Green Hill Lake Road. Both crossing points are currently at-grade crossings and they not proposed to be altered for the ultimate solution of the Western Highway Project. However, the at-grade rail crossing at Langi Ghiran Picnic Ground Road is proposed to be removed as part of the ultimate solution. Langi Ghiran Picnic Ground Road is proposed to have a grade-separated interchange with the Western Highway.

Based on the above, it is anticipated that the ultimate solution for the Western Highway Project would have minimal impact on the safety and operation of the rail line and is an improvement on the interim case.

Bus Services

Impacts to V/Line and school buses operating along the Western Highway would be similar for the interim and ultimate solutions. Refer to Section 6.6.4 for discussion of impacts on bus services.

6.7.5 Other Road User Impacts

Cyclists and Pedestrians

The impacts to cyclists and pedestrians due to the Western Highway ultimate solution would be the same as the impacts for the interim solution. Within the design for the ultimate solution no specific provisions are made for pedestrians and cyclists. According to the road rules, cyclists would still be permitted to utilise the sealed shoulder of the freeway for AMP1 conditions provided the signage does not restrict this movement. For further information regarding the impacts to cyclists and pedestrians refer to Section 6.6.5.

Emergency Service Vehicles

Similar to the interim solution for the Western Highway Project, the ultimate solution would have positive and negative impacts to emergency service vehicles. It is anticipated that emergency service vehicles would benefit from the increased capacity along the Highway and the increased ability to safely overtake other vehicles.

The decreased local accessibility due to the centre median and restricted access (only via grade-separated interchanges) may result in short increases to the distance travelled for the emergency service vehicle. However the grade-separated interchanges have been designed at regular intervals and therefore, the Project is not considered to adversely impact emergency service vehicles.

Horses, Livestock and Farming Machinery

The impacts to the movement of livestock across the Western Highway for the ultimate upgrade solution would be same as for the interim solution. The movement of livestock across freeways is generally prohibited however, given there are no current livestock crossings within the project area, it is not considered to be an issue for livestock crossings. For further details regarding the impact to livestock, and horses associated with the Western Highway Project refer to Section 6.6.5.

Agricultural machinery is not permitted on ‘freeways’, therefore alternative access arrangements would be required in the ultimate solution for these vehicles if they are required at another location. It has been identified that a couple of land holders own property on both sides of the road, consultation would be required to understand their individual requirements. However given the small number of properties affected and agricultural machinery would still be permitted on the local road network it is anticipated the impacts can be managed.

Heavy Vehicles

The impacts to heavy vehicles would be similar to the interim and ultimate solution and may even be improved due to grade-separated intersections reducing the requirement to potentially slow at intersections. Refer Section 6.6.5 for the details of impacts on heavy vehicles due to the Project.

6.7.6 Duplication Impact Assessment Summary

The ultimate solution of the Western Highway Project is expected to have the following impacts:

- Improved road safety across the project area through:
  - Increased clear zone widths;
  - Intersection grade separation to improve vehicle conflict movements;

- Grade-separation of one at-grade road-rail crossing and removal of another at-grade road-rail crossing due to restricted access to the freeway;
  - Ability for drivers to safely over take vehicles along the length of the Project;
  - Bypassing the township of Buangor; and
  - Providing adequate rest areas facilities that comply with the rest area guidelines.
- Improved traffic operation through:
  - Reduction of access points;
  - Opportunities to over take along the length of the Project;
  - Increased posted speed limit; and
  - Increased capacity to accommodate future traffic volume growth.
- Improvements to the freight task by designing the road to accommodate high productivity freight vehicles thereby allowing:
  - Improvements to efficiency of the freight task by transporting a greater volume in a single vehicle;
  - Reducing the overall heavy vehicle volume by vehicles having the ability to transport a greater volume; and
  - Travel time savings for freight vehicles due to a reduction in at-grade intersections and access points and improved overtaking opportunities.
- There is expected to be some localised impacts on travel times for landowners, due to proposed access arrangements. Access for intersecting side roads and direct property access is generally maintained through the provision 'left-in' and 'left-out' access arrangements and therefore this is likely to increase travel distance for one direction of travel. However, this impact is considered to be acceptable due to the overall benefits for road safety and Highway operations would be provided for general users.
- Minimal impacts to the operation of the rail due to the Project, as the Highway and rail line would continue to be grade separated.
- Travel time savings for bus routes travelling along the Highway.
- Increased travel time for vehicles travelling between Western Highway (west of Bunagor) and Buangor-Ben Nevis Road, due to the longer route.
- Due to the proposed highway access arrangements for Buangor-Ben Nevis Road, it is anticipated that there would be some heavy vehicles travelling through the Buangor township. However given the current average 7-day volume along Buangor-Ben Nevis Road is 131 vehicles per day, this is considered to be acceptable.

6.8 Benefits and Opportunities

This section summarises the key potential benefits or opportunities to Traffic and Transport that the Project could provide as identified in Section 6.6, and rates the significance of these benefits.

Benefit ratings are described in Table 25 while the benefits and associated rating are in Table 26.

Table 25 Benefit Ratings

Rating	Potential Project benefits
Very well	Significant benefit to the State Superior benefit to the region Policy consistency with superior positive impact
Well	Moderate benefit to the State Significant befit to the region Superior benefit to the locality Policy consistency with significant positive impact
Moderately well	Moderate benefits to the region Significant benefit to the locality Policy consistency with moderate positive impact
Partial	Minor benefits as a local level or significant benefits for a small number of individuals
Negligible	Minimal benefit at any level

Table 26 Project Benefits and Associated Rating

Benefit	Rating
Increased capacity along the key arterial road between Melbourne and Adelaide, which ‘future proofs' this key link;	Partial
Potential to reduce the traffic from local roads due to the Western Highway becoming the preferred route. This increases safety within the region as the Highway is designed to be a higher standard road and does not have at-grade intersections;	Partial
Improve efficiency of freight by designing for High Productivity Freight Vehicles.	Moderately Well
Travel time saving by not having to reduce speed though townships and by reducing the number of intersections along the Western Highway.	Partial
Increased safety through the township of Buangor.	Partial
Increased safety with all intersections becoming grade separated.	Moderately Well
Increased safety along the route by providing adequate and improved rest areas.	Partial
Increased Provision of Clear zones.	Partial

7. Mitigation Measures

This section outlines the control measures to address the identified and assessed impacts, which have been documented throughout Section 6 of this report. These control measures are recommended to reduce impacts to acceptable levels. The controls have been recommended in two levels with planned controls which are consistent with the VicRoads Contract Specifications and additional controls to further reduce the impact of the risk.

VicRoads would require the construction contractor(s) to develop and implement a Construction Environmental Management Plan (CEMP) for the Project. VicRoads standard environmental protection measures and some additional Project specific controls identified below have been incorporated into the Environmental Management Framework for the Project. VicRoads would require the construction contractor to incorporate all of these measures into the CEMP.

VicRoads standard environmental protection measures for Traffic and Transport that would be adopted for this Project include:

- DC 1160 Traffic Management
  - *1160.03 Performance Requirements*
    Functional Requirements

    The Contractor shall conduct all operations so as to minimise obstruction and inconvenience to the public, and shall not have under construction any greater length or amount of work than can be managed properly with due regard to the convenience of the public.

    The Contractor shall be responsible for all works associated with traffic management including but not limited to any earthworks, drainage, pavement, line marking, signing, traffic barriers, communication, meeting any specific requirements of municipal councils and any temporary works.

    The Contractor shall plan and undertake work under the Contract to avoid the intermingling of construction machinery and traffic. Where this is unavoidable, it shall be minimised and controlled. Appropriate traffic management and traffic control measures shall be provided at all times where construction machinery impacts or intermingles with traffic.

    Unless agreed otherwise by the Superintendent, the Contractor shall maintain all existing pedestrian movements through the Site at all times. Temporary pathways, as required, shall be provided and maintained by the Contractor to provide smooth, free-draining, clean and unimpeded access.

    Proposals for lane and/or shoulder closures shall take into consideration the safety of traffic and will be required to minimise the number of lanes affected at any one time and will be expected to only close the minimum length of road or lane necessary.

    The Contractor shall plan and undertake all works to avoid detours. Where alternative traffic arrangements are impracticable and may involve full lane closures, or an alternative route for a turning movement is temporarily not available, proposals for detours may be considered. In these situations, the detour routes shall provide the shortest acceptable path around the closure, take account of local sensitivities, the capacity of the detour route and the need for any mitigating works, and have the agreement of the municipal council(s) if the detour route includes any roads under the control of the municipal council(s).

- *1160.04 Traffic Management Plans*

  The Contractor shall prepare Traffic Management Plans for the management of individual events that impact on traffic in accordance with the Traffic Management Strategy, the performance requirements included in this specification, the requirements of the Road Management Act 2004 Worksite Safety – Traffic Management Code of Practice and the following requirements. The Traffic Management Plan shall be in accordance with AustRoads Guide to Road Design and VicRoads Supplements to AGRD and Traffic Engineering standards as appropriate for the posted speed. Each Traffic Management Plan drawing shall be certified by the Contractor.

  Where a discrepancy is identified between the requirements of this specification and the requirements of the Worksite Safety – Traffic Management Code of Practice, the Contractor shall adopt the more stringent requirements(s) as part of the work under the Contract.

  The Contractor shall be responsible for obtaining all necessary approvals, and the co-ordination, implementation and other arrangements associated with Traffic Management Plans.

- *1160.06 Traffic Management Plan Audits*

  The Contractor shall ensure that a Road Safety Audit is undertaken at the following times:

  (a) at the final design stage for each proposed Traffic Management Plan not specifically covered by arrangements shown in AS 1742.3 and its various user guides;

  (b) immediately upon implementing each TGS from an approved Traffic Management Plan;

  (c) during the first day and night a.m. and p.m. peak hours following the implementation of each TGS; and

  (d) at any other time nominated in the Worksite Safety – Traffic Management Code of Practice.

  Audits and auditors shall be in accordance with the requirements of Section 1180.

- DC 1180 Road Safety Audits

  The Contractor shall ensure that road safety audits are carried out in accordance with the Austroads Guide to Road Safety - Part 6: Road Safety Audit (2009) and by a company pre-qualified with VicRoads at the Road Safety Audit (RSAUDIT) Level. The Contractor shall be responsible for all costs associated with the completion of the audits and the implementation of the findings of the audits.

Additional, Project specific controls are also proposed to reduce risks to Traffic and Transport which include:

- Identification of appropriate haulage routes for construction traffic and heavy vehicles to be carefully selected and managed as part of TMPs with consideration for safety;
- Implement a communication strategy with the key stakeholders to manage impacts, and inform road users and the community;
- Traffic Management Strategies and Plans would be prepared by the Construction Contractor(s) prior to the commencement of construction activities to identify, assess and appropriately minimise likely impacts on road operations and road safety for road users during construction, covering:
  - Consideration is anticipated to include a range of road users including vehicle traffic, slower moving farm machinery, public transport, school buses, emergency services, cyclists, pedestrians, rail interfaces and haulage routes.
  - Accessibility and detour routes for local landholders to be considered, where appropriate.

- Monitoring and auditing is to be undertaken during construction to assess impact of the TMPs and advise of remedial action to be undertaken, if warranted.
- With relevant authorities, consideration should be made to the relocation of school bus stops within the project area during construction.
- Consider operation of at-grade road crossings of the rail line as part of the designation of haulage routes and address operational and safety impacts as part of the detailed TMPs.
- Detailed consideration should be made to ensure that impacts to travel times and accessibility for emergency services is acceptably managed.
- It is further anticipated that Road Safety Audits would be undertaken on the TMPs prior to implementation.
- TMPs are expected to be developed first as a framework document (Traffic Management Strategy) for VicRoads review and then developed in line with the works program for issue in a timely manner for review.
- Important objectives for the TMPs would be the minimisation of impacts to the surrounding arterial and local road networks. Elements of this are expected to include:
  - Provision of sufficient delineation and warning to provide safe and efficient movement of vehicles past the worksite;
  - Minimisation of the number of lanes and intersecting roads that are closed at the same time;
  - Minimisation of the duration of temporary lane/road closures;
  - Minimisation of speed limit reductions outside of work hours;
  - Minimisation of the impacts of construction works at public holidays, school holidays or other times when the Western Highway would reasonably be expected to experience higher levels of demand; and
  - Provision of adequate detour/guidance signage for motorists, where applicable.

- Road Safety Audits at the detailed design phase of the duplication would be required to review impacts to road safety from the Project.
  - The impact of vehicles exiting service road accesses, merging across through-lanes of traffic and performing U-turns at median breaks should be considered. The provision for specific vehicle types, including horse floats, through gentle acceleration and deceleration at such locations should be considered in the detailed design.
  - Consideration could be made to the potential relocation of school bus stops within the project area.
- Consideration of non-motorised road users (ensuring connectivity is not removed), public transport, school buses, emergency services and rail interfaces. Train replacement bus services are expected to be provided in the event of planned works requiring track occupation during construction;
- The provision of information as part of the community consultation process for the Project, to inform and engage with the public prior to and during construction and in operation.
  - This would assist in informing the expectations of landholders and road users of Highway operations and access arrangements during construction.

  - Information should also be provided regarding positive project outcomes (e.g. safety improvements by reducing conflict points, including from 'left-in / left-out only' treatments) to assist with perceptions of localised impacts to access post-construction.
- Ensure signage and design permits cyclists to continue to use the shoulder of the Highway such that it meets the road rule 95(2) requirements.
- Assess wildlife corridors and identify mitigation measures to reduce the requirement for wildlife to cross the Western Highway.

8. Conclusion

The Traffic and Transport Assessment for the EES of the Western Highway Project, Section 2, has been guided by the scoping requirements and evaluation objectives for this EES and the resultant evaluation criteria, which set out key considerations regarding the traffic and transport impacts during the construction and operation of the duplication.

The draft EES evaluation objectives relevant to the Traffic and Transport assessment outlined in the Scoping Requirements were as follows:

- *To provide for the duplication of the Western Highway between Beaufort and Ararat to address safety, efficiency and capacity issues; and*
- *To avoid or minimise disruption and other adverse effects on infrastructure, land use (including agriculture) and households, as well as road users resulting from the construction and operation of the Highway duplication.*

The assessment has been completed for the construction, interim operation and ultimate operation stages. The assessment has also included consideration of three alternative alignment options between Buangor and the western edge of Langi Ghiran State Park.

Following the completion of the Traffic and Transport impact and risk assessment for the duplication of the Western Highway, Section 2, a number of benefits regarding road safety and capacity are anticipated, while some impacts are also expected.

Key Benefits

The key positive impacts of the Project as they relate to traffic and transport are outlined in the section below.

The duplication is expected to provide sufficient capacity to cater for the forecasted traffic volume until at least 2040. Additionally, the duplication is expected to enable the Highway to increase the posted speed limit from 100 km/h to 110 km/h and provide significantly increased opportunities for overtaking safely. Delays due to vehicles slowing for intersections would also be improved as key intersections would be grade separated and local access would be provided via service roads, for the ultimate solution. Based on these factors, it is reasonable to assume a travel time saving for a majority of road users would be provided once the duplication is complete. Travel time savings would also occur for the interim solution as intersections are improved and the post speed limit is increased from 100 km/hr to 110 km/hr.

The upgrade works to the Western Highway are also expected to provide road safety benefits through the following design elements:

- Horizontal and vertical alignments are designed to standards;
- Clear zone width improvements or where this cannot be achieved, safety treatments would be provided to protect motorists from run-off-the-road collisions;
- Provision of a central median to reduce to occurrence of head-on collisions through a driver veering onto the opposing carriageway;
- Grade separation of key intersections with ramps providing access to/from the freeway; and
- Local access controlled via service roads.

These design features for the duplication are expected to eliminate a high proportion of existing road safety risks and provide for a higher road safety standard than currently exists.

The Western Highway is a key freight route, the duplication is expected to provide benefit to freight traffic through travel time savings and the future ability for the Highway to accommodate HPFVs, which would in-turn provide efficiencies for the movement of freight and reduce the number of heavy vehicles along the road.

Key Impacts

The key negative impacts of the Project as they relate to traffic and transport are outlined in the section below.

It is anticipated that some local landowners may have slightly increased travel times in both the interim and ultimate solutions due to reduced access to the freeway. However, there are sufficient opportunities to complete a U-Turn that this is not anticipated to be a significant issue. During the interim solution, the intersecting roads would be provided access via wide centre median treatments or 'left in' and 'left out' arrangements, while the ultimate solution would further restrict access to only the grade separated interchanges with service roads providing connections to these interchanges.

Additionally, for the ultimate solution the travel time for vehicles travelling between Bunagor-Ben Nevis Road and the Western Highway would be impacted due the access arrangements of Peacocks Road being a half diamond interchange with vehicles accessing the westbound carriage either side of Bunagor township. These access arrangements would particularly result in increased travel time for vehicles travelling between Western Highway (west of Bunagor) and Buangor-Ben Nevis Road. Additionally, due to the proposed highway access arrangements for Buangor-Ben Nevis Road, it is anticipated that there would be some heavy vehicles travelling through the Buangor township. However given the current average 7-day volume along Buangor-Ben Nevis Road is 131 vehicles per day, this is considered to be acceptable.

Construction of the duplicated Highway is not expected to have unacceptable impacts to the operation of the Highway. The risk assessment has addressed potential operational and road safety impacts and outlined mitigation measures for the identified road users.

The majority of potential negative impacts of the Project with regard to road operations, safety and effects on road users would be expected to occur during the construction phase, where construction related activity would impact on the existing network. This assessment has identified that acceptable outcomes would be achieved through the implementation of detailed Traffic Management Plans and through community consultation to inform road users' expectations during the construction stages.

Overall, from a Traffic and Transport perspective there is no significant difference between the three options.

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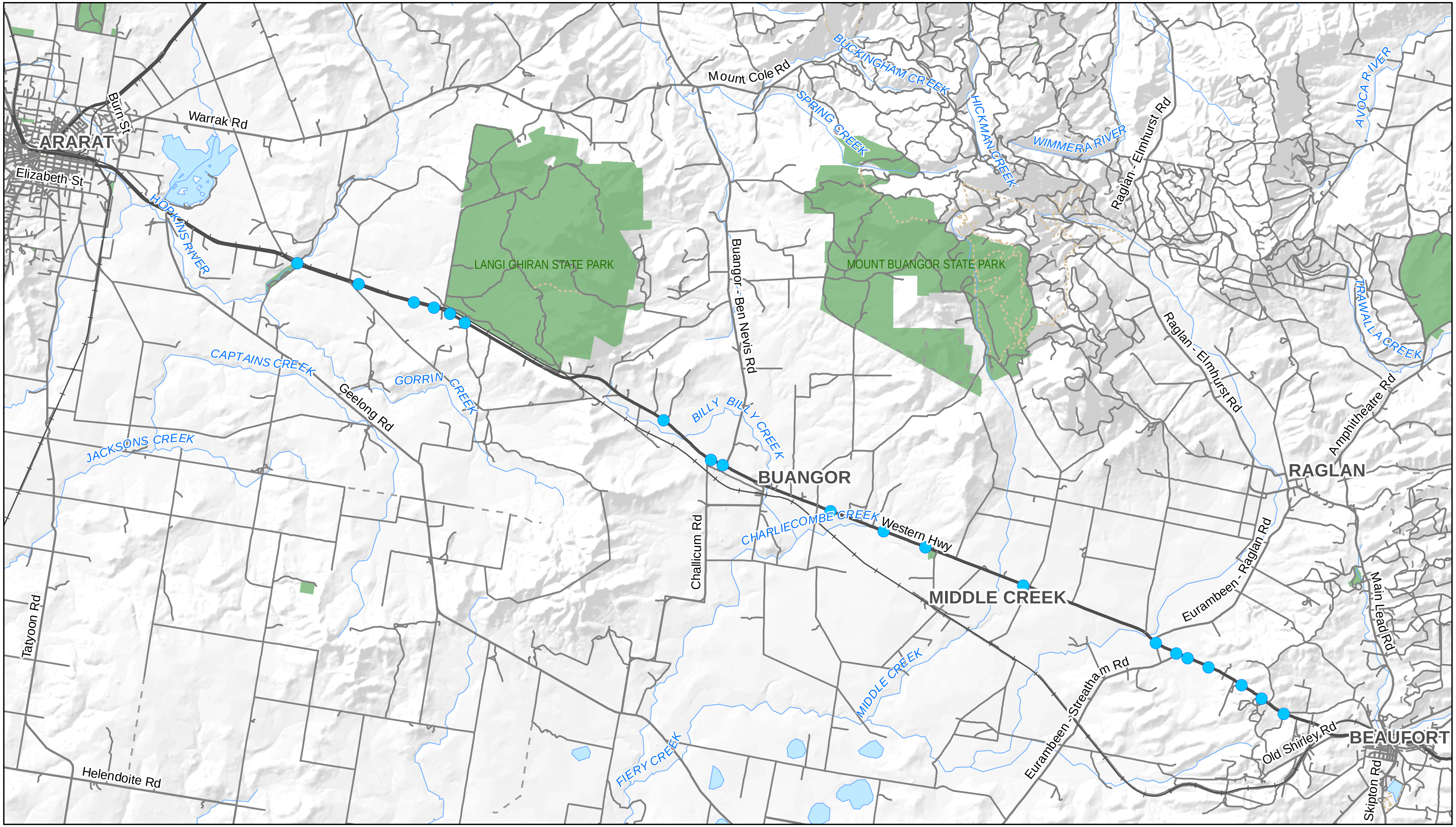
Appendix A

Crash Statistics and Map



Paper Size A4

0 0.5 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

LEGEND

- Crash Locations
- Highway
- Sealed road (arterial & local)
- Unsealed road
- Unsealed track
- Sealed walking/bike trail
- Unsealed walking/bike trail

GHD
CLIENTS | PEOPLE | PERFORMANCE

vicroads

VicRoads
Western Highway Project

Job Number | 31-27558
Revision | B
Date | 22 Aug 2012

Beaufort to Ararat
Previous Crash Locations

Appendix A

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180 Lonsdale Street Melbourne VIC 3000 Australia **T** 61 3 8687 8000 **F** 61 3 8687 8111 **E** melmail@ghd.com **W** www.ghd.com

Data source: GHD, 2012; DSE, VicMap, 2012; VicRoads, 2012. Created by:splaird

Route=WESTERN HIGHWAY (151867-190315) Severity=All Casualty Date=01/01/2007 to 31/12/2011 ABS=ABS to receive accident

LGA	Map KM	Location	Severity K/SI/Inj Road User/Age/Sex/Injury	Date Time	Day DCA	Traf. Control Sub DCAs	Light Road	Veh Dir.	Units/ Object Hit	Accident No MF/Image
PYRENEES	57G8 152436	On WESTERN HIGHWAY (277mW) btw MARTINS LANE and	Other injury a 0/0/1 Dri/63/M/3	29/10/2009 18:50	Thu 171	No control Q02 V01	Day Dry	W *	Station Wagon/T	T20090042218 0/0
PYRENEES	57G8 152458	On WESTERN HIGHWAY (299mW) btw MARTINS LANE and UNNAMED	Serious injury 0/1/0 Dri/52/F/2	11/01/2009 20:55	Sun 171	No control Q02 V01	Dark Dry	NW*	Car/Tree (shrub	T20090001189 0/0
PYRENEES	57G8 153663	On WESTERN HIGHWAY (138mSE) btw CENTRE ROAD and GRAMPIANS VIEW ROAD	Other injury a 0/0/1 Pas/20/M/4 Dri/56/F/3 Dri/28/M/4	07/04/2010 06:50	Wed 140	No control P01	Dusk Wet	N * W	Car Panel Van	T20100013311 0/0
PYRENEES	57G8 154846	On WESTERN HIGHWAY (819mNW) btw CENTRE ROAD and EURAMBEEN-STREATHAM ROAD	Serious injury 0/1/3 Pas/43/M/3 Pas/9/M/2 Dri/23/M/3 Dri/42/F/3	24/12/2008 14:50	Wed 150	No control NRQ	Day Dry	W * E	Car/Guide post Car	T20080047951 0/0
PYRENEES	57G8 155290	On WESTERN HIGHWAY (499mE) btw EURAMBEEN-STREATHAM ROAD and	Fatal accident 3/0/0 Pas/25/F/1 Pas/48/F/1 Dri/24/M/1 Dri/47/M/4 Dri/33/M/4	22/10/2010 23:00	Fri 120	No control L03	Dark Wet	SE* NW NW	Car/Other Fixed PM B-DOUBLE PM B-DOUBLE	T20100042542 0/0
PYRENEES	57F8 155789	At WESTERN HIGHWAY and EURAMBEEN-STREATHAM ROAD	Serious injury 0/2/1 Pas/0/M/2 Dri/36/M/2 Dri/30/M/3	03/01/2009 13:30	Sat 132	No control I05 N01	Day Dry	NW* NW	Station Wagon Utility	T20090000288 0/0
PYRENEES	57F8 156581	At WESTERN HIGHWAY and CROCKERS LANE	Other injury a 0/0/1 Pas/23/M/3 Dri/73/M/4 Dri/23/M/4	31/08/2010 22:45	Tue 152	No control B02	Dark Dry	NW* NW	PM B-DOUBLE Car	T20100035100 0/0
PYRENEES	57F8 156796	On WESTERN HIGHWAY (200mSE) btw STARS ROAD and	Serious injury 0/1/0 Dri/35/M/2	12/01/2009 18:30	Mon 181	No control Q04 V01	Day Dry	SE*	HV-RIGID>4.5T/E	T20090005366 0/0
ARARAT	57E8 162440	On WESTERN HIGHWAY (299mW) btw MIDDLE CREEK ROAD and	Fatal accident 1/3/0 Pas/46/F/2 Pas/48/M/4 Pas/15/M/2 Mot/30/M/1 Dri/18/F/2	08/04/2010 19:00	Thu 120	Unknown L03	Dark Dry	SE* NW	Motor Cycle Car	T20100013378 0/0

All users, please note details of abbreviation used to record heavy vehicle information:

SEMI TRLR PT is Prime Mover (No of Trailers Unknown); TRK EXCL SEMI PT is Rigid Truck(Weight Unknown); PM ONLY is Prime Mover Only; PM SING TRLR is Prime Mover - Single Trailer; PM B-DOUBLE is Prime Mover - B-Double; PM B-TRIPLE is Prime Mover - B-TRIPLE; LCVR <=4.5T is Light Commercial Vehicle (Rigid) <=4.5 Tonnes GVM; HV-RIGID >4.5T is Heavy Vehicle (Rigid)>4.5 Tonnes GVM;

Route=WESTERN HIGHWAY (151867-190315) Severity=All Casualty Date=01/01/2007 to 31/12/2011 ABS=ABS to receive accident

LGA	Map KM	Location	Severity K/SI/Inj Road User/Age/Sex/Injury	Date Time	Day DCA	Traf. Control Sub DCAs	Light Road	Veh Dir.	Units/ Object Hit	Accident No MF/Image
ARARAT	57E8 164762	On WESTERN HIGHWAY (1139mE) btw MILE POST LANE and WOODNAGGERAK ROAD	Serious injury 0/3/6 Pas/12/M/3 Pas/10/M/3 Pas/6/U/3 Pas/64/F/2 Pas/7/U/3 Pas/4/U/3 Pas/6/F/3 Dri/25/F/4 Dri/46/M/2 Dri/71/M/2	02/04/2008 11:45	Wed 130	No control N02	Day Wet	E E E *	Car Station Wagon Car	T20080011781 0/0
ARARAT	57E7 166348	On WESTERN HIGHWAY (446mW) btw MILE POST LANE and ANDERSON ROAD	Serious injury 0/1/0 Mot/48/M/2	15/12/2009 17:50	Tue 174	No control V01	Day Dry	W *	Motor Cycle	T20090049054 0/0
ARARAT	57D7 170096	On WESTERN HIGHWAY (89mSE) btw BUANGOR-BEN NEVIS ROAD and WESTERN HIGHWAY	Serious injury 0/1/0 Dri/20/F/2	13/09/2011 09:00	Tue 173	No control Q09 V01	Day Dry	SE*	Car/Building	T20110032457 0/0
ARARAT	57D7 170116	On WESTERN HIGHWAY (69mSE) btw BUANGOR-BEN NEVIS ROAD and WESTERN HIGHWAY	Other injury a 0/0/1 Dri/58/M/3	19/04/2011 05:00	Tue 173	No control Q02 Q03	Dark Dry	NE*	PM SING TRLR/Tr	T20110015674 0/0
ARARAT	57D7 171637	On WESTERN HIGHWAY (878mNW) btw GRAVEL ROUTE ROAD and POPE ROAD	Other injury a 0/0/1 Pas/45/M/4 Pas/43/F/4 Pas/60/F/3 Pas/60/M/4 Dri/16/F/4 Dri/28/M/4	21/01/2007 16:05	Sun 130	No control N02	Day Wet	NW* NW	Station Wagon Car	T20070002284 0/0
ARARAT	57C7 176113	On WESTERN HIGHWAY (504mW) btw HILLSIDE ROAD and LANGI GHIRAN PICNIC GROUND ROAD	Serious injury 0/1/0 Dri/53/M/2	09/01/2007 04:30	Tue 171	No control Q10 V01	Dark Dry	W *	Utility/Other F	T20070001594 0/0
ARARAT	57C7 177110	On WESTERN HIGHWAY (1500mW) btw HILLSIDE ROAD and LANGI GHIRAN PICNIC GROUND ROAD	Other injury a 0/0/1 Dri/64/M/3	29/09/2007 06:50	Sat 171	No control Q02 V01	Dusk Dry	E *	Utility/Tree (s	T20070035232 0/0
ARARAT	57C7 178342	On WESTERN HIGHWAY (1401mE) btw LANGI GHIRAN PICNIC GROUND ROAD and HILLSIDE ROAD	Other injury a 0/0/1 Pas/18/M/4 Dri/39/F/3 Dri/49/M/4	05/09/2010 00:04	Sun 166	No control Q10	Dark Wet	W * E	Car/Other Fixed PM SING TRLR	T20100035726 0/0
ARARAT	57C7 179744	At WESTERN HIGHWAY and LANGI GHIRAN PICNIC GROUND ROAD	Serious injury 0/1/0 Pas/57/F/2 Dri/26/M/4	08/12/2011 10:20	Thu 173	No control Q02 V01	Day Dry	W *	Car/Tree (shrub	T20110039943 0/0

All users, please note details of abbreviation used to record heavy vehicle information:

SEMI TRLR PT is Prime Mover (No of Trailers Unknown); TRK EXCL SEMI PT is Rigid Truck(Weight Unknown); PM ONLY is Prime Mover Only; PM SING TRLR is Prime Mover - Single Trailer; PM B-DOUBLE is Prime Mover - B-Double; PM B-TRIPLE is Prime Mover - B-TRIPLE; LCVR <=4.5T is Light Commercial Vehicle (Rigid) <=4.5 Tonnes GVM; HV-RIGID >4.5T is Heavy Vehicle (Rigid)>4.5 Tonnes GVM;

Route=WESTERN HIGHWAY (151867-190315) Severity=All Casualty Date=01/01/2007 to 31/12/2011 ABS=ABS to receive accident

LGA	Map KM	Location	Severity K/SI/Inj Road User/Age/Sex/Injury	Date Time	Day DCA	Traf. Control Sub DCAs	Light Road	Veh Dir.	Units/ Object Hit	Accident No MF/Image
ARARAT	57B7 181852	On WESTERN HIGHWAY (766mE) btw BRADY ROAD and LANGI GHIRAN PICNIC GROUND ROAD	Serious injury 0/1/1 Pas/7/F/3 Pas/12/F/4 Dri/34/F/2	16/08/2008 09:45	Sat 171	No control Q02 V01	Day Wet	E *	Car/Tree (shrub	T20080030200 0/0
ARARAT	57B6 184892	On WESTERN HIGHWAY (151mNW) btw WARRAYATKIN ROAD and UNNAMED	Serious injury 0/1/0 Dri/80/F/2	19/12/2007 08:30	Wed 183	No control Q02 V01	Day Wet	W *	Car/Tree (shrub	T20070046369 0/0

Number of Accidents: 20

Note : * Indicates vehicle # 1 as per DCA chart

NB: Any complex intersections included in this report may not have had all accidents included.

All nsers, please note details of abbreviation used to record heavy vehicle information:

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Route=WESTERN HIGHWAY (151867-190315) Severity=All Casualty Date=01/01/2007 to 31/12/2011 ABS=ABS to receive accident

ACCIDENTS BY YEAR AND SEVERITY and PERSONS INVOLVED BY YEAR AND INJURY LEVEL

	ACCIDENTS				PERSONS				
Year	Fatal	Serious Injury	Other Injury	Total Accidents	Killed	Taken To Hospital	Other Injury	Not Injured	Total Persons
2007		2	2	4		2	2	5	9
2008		3		3		5	10	2	17
2009		4	1	5		5	2		7
2010	2		3	5	4	3	3	9	19
2011		2	1	3		2	1	1	4

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Route=WESTERN HIGHWAY (151867-190315) Severity=All Casualty Date=01/01/2007 to 31/12/2011 ABS=ABS to receive accident

DCA BY ACCIDENT SEVERITY

DCA	Fatal Accident	Serious Injury Accident	Other Injury Accident	Total Accidents	Total Persons
120	2			2	10
130		1	1	2	16
132		1		1	3
140			1	1	3
150		1		1	4
152			1	1	3
166			1	1	3
171		3	2	5	7
173		2	1	3	4
174		1		1	1
181		1		1	1
183		1		1	1

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	N. Guy	L. Hartigan		M. Tansley	M. Tansley	12-07-2011
1	J. Tan	L. Hartigan		M. Tansley	M. Tansley	05-07-2011
2	N.Guy	D.Gregor				2-02-2012
3	N.Guy	D.Gregor				7-05-2012
4	N.Guy	D.Gregor		M.Tansley	M. Tansley	23-05-2012
5	N.Guy	D.Gregor	D. Gregor	M.Tansley	M. Tansley	10-08-2012